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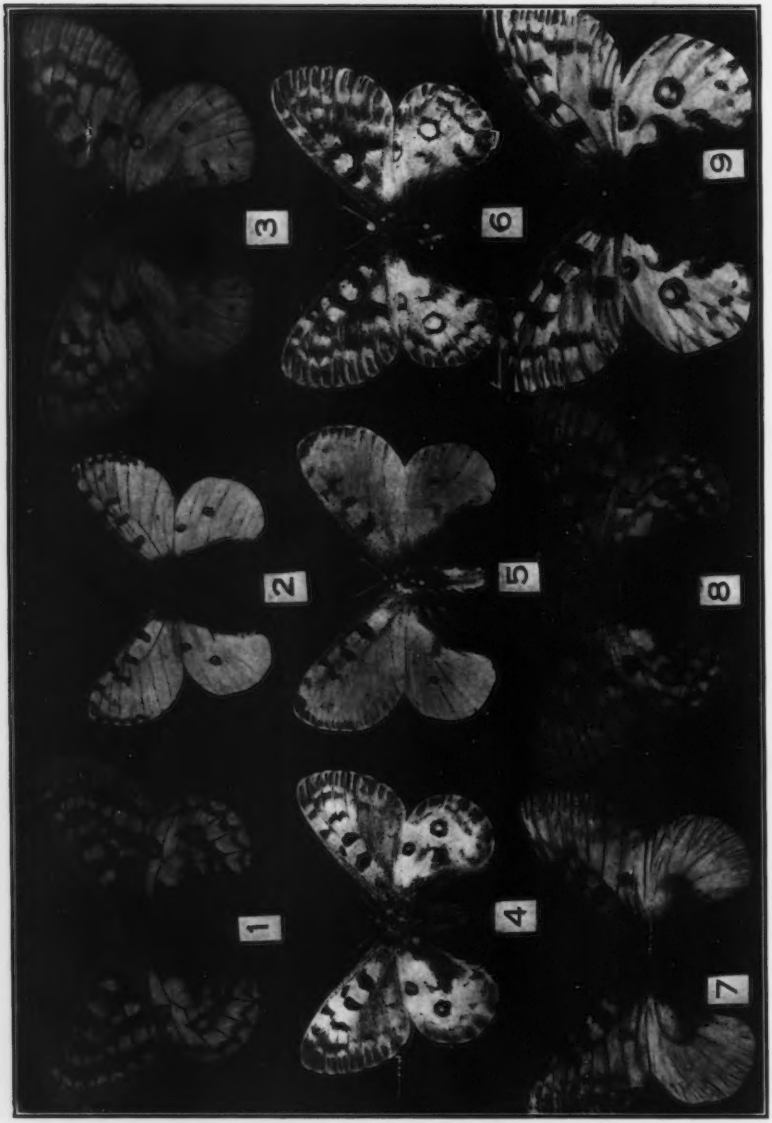
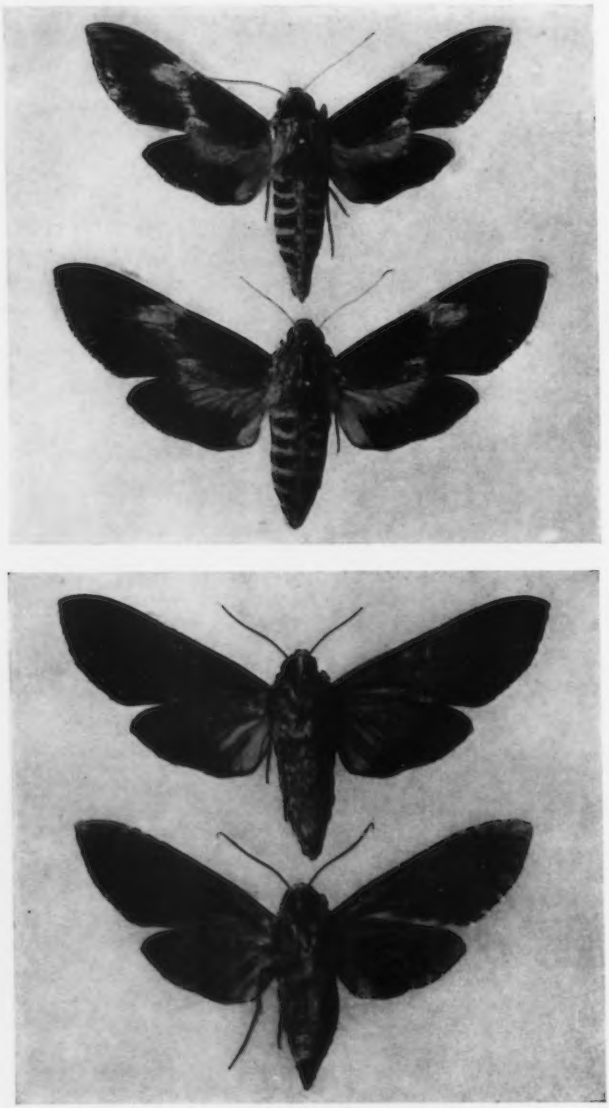


PARNASSIUS IN AMERICA—SKINNER.

1. THOR, 2. MENDICA, 3. MENETRIESII, 4–6. NANUS, 7. IMMACULATA, 8. HERMODUR, 9. NOMINULUS.

Plate XII issued with this number is to replace Plate XII of the May number.



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ISOGNATHUS RIMOSA WOODI, 1. ♂, 2, 3, ♀.
I. RIMOSA RIMOSA, 4. ♀.—RAMSDEN.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

VOL. XXVII. JUNE, 1916. No. 6.

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The Status of Isognathus congratulans and a New Form of I. rimosa from Cuba (Lep.).

By CHARLES T. RAMSDEN, Guantánamo, Cuba.

(Plate XIII)

Drs. Rothschild and Jordan in their monumental work, "A Revision of the Lepidopterous Family Sphingidae," London, 1903, page 357, say under *Isognathus congratulans*: "♂ bands of abdomen distinct. Forewings, above, for the greater part blackish brown. *This may be an extreme form of rimosa.* [The italics are mine.] In Tring Museum 1 ♂ from Cuba; also in Berlin Museum."

Unfortunately the Tring Museum did not have a long enough series to determine whether it was a good species, or only an extreme form of *rimosa,* as Drs. Rothschild and Jordan suspected.

During a recent visit of William C. Wood, Esq., of New York City to Guantánamo, we went over the series of more than fifty specimens of *rimosa rimosa,* and *congratulans* in my collection and, after deliberate and careful study, came to the conclusion that *congratulans* did not have specific standing, for the following reasons.

In the above mentioned series were intergrades from *rimosa rimosa* to *congratulans,* not one, but several of them. The specimens of this series were all taken at light in Guantánamo, the dates ranging over a number of years.

However, it was Gundlach who first noticed that there was no specific difference between them, and he mentions the fact in his work, "Contribución á la Entomologia Cubana," Habana, 1881, where, on pp. 215-218 he discusses *Dilophonota rimosa.* I herewith translate the part referring to *congratulans,* as follows: "In 1858 I found, at Santiago de Cuba, an individual which I considered a different species, and named it *congratulans.* I made this known to Mr. Grote, who also considered it a new species, describing it as such in the Annals of the Lyceum of Natural History, New York, Vol. viii, November, 1865. The type was not returned to me. Through Mr. Grote's carelessness this specimen, together with specimens of other new species belonging to me, went with the collection of the unfortunate Mr. Robinson, when it was given to the Central Park Museum of New York. This I learned from a letter of Mr. Grote.

In 1878, I reared a batch of caterpillars of this species and found among the moths some dark colored individuals that I must consider the same as my *congratulans,* and for this reason, I consider this name applicable only as a dark form of *rimosa.*"

Gundlach then goes on to describe *congratulans* as follows: "It differs in having the forewings so dark that one cannot see the ashy ground color of the type [by "type" he means *rimosa*], in another example of my collection the lighter ground color of the type is slightly evident."

There can be no doubt from the above as to the status of

congratulans, as Gundlach bred, not only the dark as well as the normal form of *rimosa,* but also the intermediate, all from the same batch of larvae, and my more recent series, with its several intermediates, seems to confirm the fact.

Besides the above there is a third, and still undescribed form of *rimosa* from Cuba. This differs so much in color as well as in pattern from *rimosa rimosa,* that I am almost tempted to give it specific rank. This may be decided later; for the present it may be known as:—

Isognathus rimosa woodi n. subsp.

Differs in general appearance from *rimosa rimosa* in having the ground colour of the forewings blackish instead of greyish.

Male: Expanse (one wing) 42 mm. Female: Expanse (one wing) 46 mm.

♂. Upperside. Forewings blackish-brown divided perpendicularly into two parts by a greyish-white band which begins as a broad costal patch, just beyond the cell, narrowing at the center of the wing, and again broadening into another patch at the inferior margin.

Hindwings with marginal band entirely blackish-brown, nearly black, otherwise as in *rimosa rimosa.*

Underside. Forewings and hindwings with a broad marginal blackish brown band, perceptively darker toward its interior edge. Remainder of wings similar to *rimosa rimosa.*

♀. Similar to ♂, but dark portions of wings are intense and uniform in color.

Body same as *rimosa rimosa.*

Types ♂ and ♀ deposited in the collection of the Academy of Natural Sciences of Philadelphia. Paratypes in the collection of the author. Specimens taken, ♂, July 12, 1911; ♀, May 3, 1914, at electric light, Guantánamo, Cuba.

These specimens have long lain in my cabinet, and it is at the instance of that enthusiastic, and far too modest student of the Sphingidae, my very good friend, Mr. William C. Wood, of New York City, that I have decided to describe this insect, which I take pleasure in naming for him.

EXPLANATION OF PLATE XIII.

Figs. 1-3. *Isognathus rimosa woodi,* n. subsp.; 1. ♂, and 2. ♀, upper sides, 3. ♀, under side.

Fig. 4. *I. rimosa rimosa,* ♀, under side.

The Lines of Descent of the Lower Pterygotan Insects, with Notes on the Relationships of the other Forms.

By G. C. Crampton.*

It is a rather interesting fact that those structures which are apparently of no vital importance to the organism, are frequently of the greatest value as indications of relationships between the larger groups (orders, etc.) of insects. This may perhaps be explained by the fact that structures which are of vital importance to the organism would be the ones most directly concerned in the struggle for existence, and would therefore be the ones most acted upon and most profoundly modified by natural selection—or, as a Lamarkian would express it, these structures would be the ones most frequently employed, and would therefore be the ones the most profoundly changed by use.

The nature and arrangement of the thoracic sclerites furnish examples of such structures, which are of little or no vital importance to the organism (since they are practically wanting in some forms), yet are among the most important characters for determining the relationships of the different groups of insects, since they remain as "true to type," or as little modified, as any structures of the body; and in most instances have furnished the clues which were followed out and verified by the study of other structures.

Other structures which have proven to be of considerable value in determining the relationships of the lower insects are: the character of the antennal segments, the nature and location of the compound eyes, the outline of the head, the character of the mouthparts (particularly of the labium), the nature of the terminal abdominal segments and their appendages (the female external genitalia being especially "true to type," or but little modified) and the appendages of the thorax. Conclusions based largely upon an examination of the wings alone, which is apparently necessary in the study of fossil insects, may lead to entirely erroneous results, unless verified by the study of other sets of structures, and this may in some

* Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

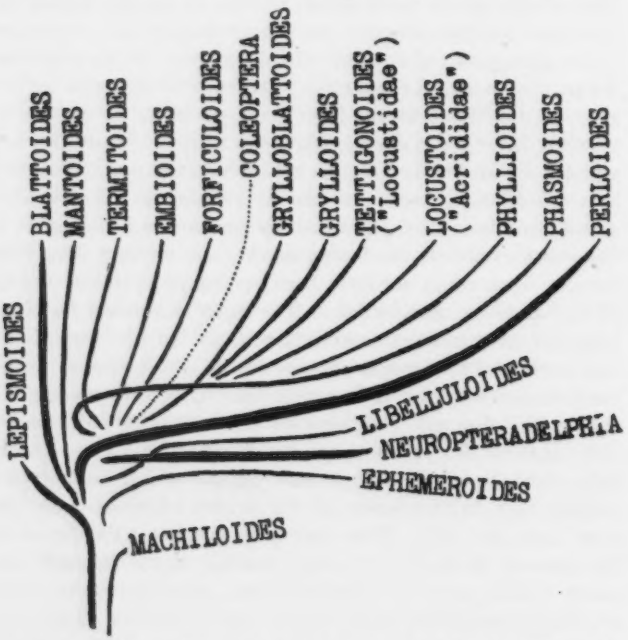
measure account for the marked difference in the lines of descent here given, and those depicted in Handlirsch's *"Fossilen Insekten."*

It is an almost hopeless task to attempt to determine the lines of descent in the different groups of insects, unless one is able to compare together the most primitive representatives of the groups in question, or to make a study of the annectent forms combining in themselves characters common to several groups. On this account, I am deeply indebted to Mr. A. N. Caudell, Mr. C. C. Gowdey, Maj. A. D. Imms, Dr. K. Jordan, and Dr. E. M. Walker for the use of valuable specimens such as *Grylloblatta, Timema, Arixenia, Labidurodes, Embia,* etc., which have been of the greatest service in furnishing clues to the relationships of the lower insects, and without which the present work could not have been carried on with any degree of certainty or satisfaction. The clues furnished by these primitive or annectent insects have been further carried out and verified by a comparative study of the principal structural features in the different groups of lower insects; but the detailed discussion of these structures may be more profitably taken up in a series of articles, in which they can be more fully treated than in the present paper—which is therefore offered as a brief resumé of the results obtained from the more extended study of the insects in question. Furthermore, the present discussion is largely limited to the consideration of the lower groups of winged insects, since the rather complicated interrelations of the lower insects must be clearly understood, before one can proceed to the study of the higher forms.

The accompanying diagram is offered merely as an expedient to aid in visualizing the points brought out in the following discussion, rather than as an attempt to portray the actual relations of the various groups, since it is practically impossible to depict correctly the true relative positions of the different lines of descent, in a diagram drawn in one plane. It requires a figure of *three dimensions* to portray the fact that several groups approach each other from different angles, and if an attempt were made to represent this in a diagram

drawn in one plane, there would result such an intricate crossing of lines as to render it practically incomprehensible and therefore useless.

Since the termination "-oidea" has always been restricted to



groups of the rank of a *super-family* (e. g. Muscoidea, Ichneumonoidea, etc.), Handlirsch and his followers have done violence to established usage in employing the termination "-oidea" to designate groups to which they would attribute the rank of an *order*. On the other hand, the method of designating the different groups by some familiar term (which immediately calls to mind the typical or well known representatives of the group as a whole) is self-explanatory in a diagram, and therefore has much to recommend it. On this account, I have used the termination "-oides" (rather than the

pre-empted termination "-oidea") in connection with the name of a well known or typical family merely as a convenient expedient to designate the different groups shown in the diagram. With the exception of the Grylloids and Tettigonoids (which form the Orthoptera, in the restricted sense), I would regard all of these groups as of the rank of an order, and have therefore referred to them in the text, by terms ending in "-ptera" (e. g. Dermaptera, Plecoptera, etc.) in accordance with general entomological usage.

As is shown in the diagram, the Phyllioid forms, or Phylliidae, are closely related to the Phasmoid group, or Phasmidae, yet occupy a position somewhat intermediate between the Phasmidae and the true Locustidae—which are usually incorrectly called "Acrididae." Although the Phyllidae are closely related to the Phasmidae, they are as distinct from them as the Neuroptera are from the Mecoptera, and should therefore be classed in a distinct order, the *Phyllioptera,* as was mentioned in a previous publication (Entomological News, Vol. 26, p. 347). It may be remarked, however, that the distinctive characters there given, apply chiefly to the females, since the males of the Phylliidae (e. g. those of *Phyllium scythe*) have long antennae, and well developed hind wings.

The true Locustidae (usually termed "Acrididae") occupy a position intermediate between the Phylliid-Phasmid group, and the Gryllid-Tettigonid group, as indicated in the diagram. Phasmoid forms, such as *Timema,* have retained many characters suggestive of the ancestral condition of the Locustid group, thus suggesting that the Locustid line of development may lead toward the Phasmid line of descent, while that of the Gryllid-Tettigonid group, although closely paralleling the Locustid line of development, may lead toward the Grylloblattid line of development; but this point may be better taken up under the discussion of the relationships of the Gryllidae and Tettigonidae. The reasons for considering the Locustoid forms as representing a distinct order, the *Diphtheroptera,* have already been given (Ent. News, Vol. 26, p. 348) and need not be further considered here.

As is indicated in the diagram, the line of descent of the Tettigonidae (which are usually incorrectly termed "Locustidae") closely parallels that of the Gryllidae, the more primitive members of the two groups being very closely related, although the more highly modified members of the two lines, are quite widely divergent. The Grylloid and Tettigonoid forms comprise the order *Orthoptera* (in the restricted sense) which occupies a position somewhat intermediate between the Phasmid and the Grylloblattid lines of descent and is also related to the Perlids. A study of the extremely interesting insect *Grylloblatta campodeiformis* Walk., led me to believe that the Gryllids and Tettigonids approach more closely to the Grylloblattid line of descent, while the true Locustids ("Acrididae") approach rather more closely to the Phasmid line of descent; but an examination of an extremely primitive Grylloid insect from Thayetmyo, Burmah (which bears a slight resemblance to an Ephemerid!) would indicate that the Gryllids also approach the Phasmid line of descent, and such primitive Tettigonoid forms as *Phasmodes* (the *Prophytoptera*—Ent. News, Vol. 26, p. 348), are remarkably Phasmid-like, so that it is doubtless more correct to consider the Grylloid-Tettigonoid group as arising from forms intermediate between the Phasmoid insects and the Grylloblattoid insects (which also approach the Phasmid line of descent).

Certain Phasmoid insects, such as *Timema,* have retained many characters suggestive of the Perlid group, and many other facts indicate that the Phasmid line ultimately leads back to that of the Perloid insects. The Phasmid line of descent also converges toward that of the Grylloblattids, and at the same time approaches the Mantoid group in some respects, although the Mantoid insects have followed a somewhat different course of development. In order to show in the diagram, that the Phasmoid line not only leads back to the Perloid line, but also approaches the Mantid line, and is likewise connected with the Grylloblattoid line by intermediate forms, it was necessary to swing the Phasmoid line around from its position near the Mantoid line, and over the other

lines of descent, in order to bring it into a position in which it could be shown in the diagram that the Locustids, Gryllids, etc., sprang from forms intermediate between the Phasmid group and the Grylloblattid group. In thus swinging the Phasmid line around over the other lines of descent, it became impossible to show that the Phasmid line also converges with that of the Grylloblattids, etc., upon the Perloid line of descent, so that it should be understood that the Phasmid and Grylloblattid lines are much more intimately related than is shown in the diagram. The Phasmid group (called the *Cheleutoptera*, Ent. News, Vol. 26, p. 348) forms a distinct order of insects, second in importance only to the Perlid group, from the standpoint of phylogeny, since it is paralleled by, or is approached by, so many other lines of descent; and in some regards it is fully as important as the Perloid line itself, although I am inclined to consider that the Perlids, as a whole, are more primitive than the Phasmids.

As was mentioned above, the Grylloblattid line of development parallels, or converges toward that of the Phasmids, and both lead back to the Perlid group. This, however, does not mean that living Grylloblattids were descended from living Perlids, but is merely a way of expressing the fact that the Perlids have departed as little as any group, from the ancestral condition characteristic of the common ancestors of the Grylloblattids, Perlids, etc. As is shown in the diagram, the Grylloblattoid, Forficuloid and Embioid lines all converge toward the Perloid line. It could not be shown in the diagram, however, that the Grylloblattids are quite closely related to the Termites, and at the same time that their closest affinities are with the Forficuloid and Embioid (with the Phasmoid) lines among the more primitive forms, although it is indicated that the Gryllids, Tettigonids, etc., occupy a position intermediate between the Grylloblattoid and the Phasmoid lines of descent. The Grylloblattoid line is much more closely paralleled by the Embiid and Termitid lines of descent than is indicated in the diagram, since a comparison of a wingless female *Embia major* with the wingless female *Grylloblatta* suggests a very

close relationship between the two; but for that matter the lines of descent of the Perlid, Phasmid, Grylloblattid, Forficulid, Embiid and Termitid groups all converge as we trace them further back, so that it is extremely difficult to tell which are the most closely related. The Grylloblattid group forms a distinct order termed the *Notoptera* (Ent. News, Vol. 26, p. 347), which are among the most interesting and important of the annectent forms surviving to the present day.*

As shown in the accompanying diagram the *Coleoptera* are rather closely related to the Forficulids, and also to the Embiids and Grylloblattids, but ultimately lead back to the Perlid line of descent. Indeed, the Coleoptera are a much more ancient group than is usually thought to be the case, and although some of the representatives of the group are quite highly specialized, others show undoubted affinities with the lower insects as shown in the diagram. The *Apocoleoptera* (Platypsylloides) or Platypsyllidae form a distinct order, arising as an offshoot from the main line of descent of the Coleoptera, and in some respects they resemble the parasitic Forficuloid group Hemimeridae. Whether this is due to a convergence in form as the result of similar modes of life, or is due to the fact that the Coleopteron and Forficuloid lines of descent closely parallel each other, is not clear.

The Forficulid line of descent parallels that of the Embiids and Grylloblattids rather closely, as is shown by a comparison of the rather primitive Forficulid *Labidurodes*, with specimens of *Grylloblatta* and *Embia major* Imms. Furthermore, such primitive Forficulids as *Arixenia*, show undoubted Perloid affinities, and the Embiid, Forficulid, Grylloblattid and Perlid lines of descent are to be considered as paralleling each other extremely closely. Together with the other groups just mentioned, the Forficulids converge toward the Termitid and Phasmid lines of development (the Phasmid *Timema* having retained certain characters suggestive of those found in the

* The color of these insects is likewise extremely primitive, yellow to brown-yellow being apparently the original color of the ancestral Pterygota, while the paler shades (white or tinge of gray) are more characteristic of the Apterygotan forms.

Forficulid *Labidurodes*). I have not seen specimens of *"Hadotermes japonicus"* described by Hagen 1868 (Proc. Bost. Soc. XI, p. 399), but Sharp (Insects, Part I) states that this insect described by Hagen as a Termite, is really a Forficulid, so that this Forficulid must be very similar to the Termites, if Hagen was deceived by it. The *Hemimerus*-like forms represent an off-shoot from the Forficuloid line. The Hemimeroides are not represented in the diagram, but their affinities are undoubtedly strongly Forficulid, though they may perhaps represent a distinct order called *Dermodermaptera* by Verhoeff. The term Dermaptera, applied to the Forficulids, may possibly be restricted to another group of Orthopteroid insects, on the grounds of priority; if this be necessary, the later term *Euplexoptera* might be applied to the Forficulid group.

The Embiidae as a whole, are extremely closely related to the Perlids, perhaps more nearly than to any other group of insects. The wingless females of *Embia major* Imms are exceptionally favorable for comparison with the wingless females of *Grylloblatta* and *Timema,* and their unusually large size and well pigmented sclerites makes the study of their structural details a comparatively simple matter, although the more primitive genus *Clothoda* would doubtless be of greater importance from the standpoint of the determination of the genealogy of the group. A study of *Embia* has convinced me that the Grylloblattoid, Embioid, Forficuloid, Termitoid and Phasmoid lines of descent all converge upon the Perloid line. Furthermore, the Embiids combine characters common to the Termites and Forficulids (with the Grylloblattids), so that they may be considered as occupying a position somewhat intermediate between the Forficulids and Termites, as shown in the diagram, although their closest affinities are with the Perlid group. I formerly (Ent. News, Vol. 26, p. 346, etc.) applied Packard's term, Platyptera (used in the restricted sense) to the Embiid order, but I find that the designation Platyptera was applied to the Diptera by Meigen, 1803, and to the Pisces by Cuvier 1837, long before Packard applied it to the Orthopteroid insects, so that it is necessary to change the term

Platyptera to *Euplatyptera,* in referring to the Embiid group.

As was mentioned above, the Termites occupy a position somewhat intermediate between the Grylloblattid-Embiid-Perlid group and the Blattidae, and in many respects, they approach very closely to, or parallel the Blattoid line, in their phylogenetic development. I have been unable to study such primitive Termites as *Mastotermes,* but I feel certain that these will show marked affinities with the Grylloblattid-Embiid-Perlid group, since those Termites which I have been able to examine all indicate a close relationship to this group, and I think that the Termitid line leads back to the Perlid rather than to the Blattid line of development, as is indicated in the diagram. As will be discussed later on, the Blattid and Perlid lines ultimately approach each other quite closely, so that the resemblances of the Termites to the Blattids may possibly be explained as the retention in both lines, of characters inherited from the common ancestral group from which sprang the ancestors of the Blattids, Termites and Perlids. The affinities of the Termites to the Blattid group may, on the other hand, be much closer than is indicated in the diagram; but this point can be definitely determined only upon the examination of the most primitive representatives of the Termitid group, which are not at present accessible to me. Since this group froms a distinct order, the term *Isoptera* should be applied to it. Although I have been unable to obtain specimens of the rare order *Zoraptera,* described by Silvestri, I would judge from the figures of these insects, that they form an off-shoot from the main Termite stem, and have departed but little from the rest of the Termitoid group.

Since the Perlid line of development is approached or is paralleled by so many other lines of descent, it forms one of the most important of the lower groups of winged insects, the only other lower group which rivals it in this particular being the Phasmid group. The Perlids as a whole are as primitive as any winged insects, and, with the Blattids, must be regarded as the nearest living representatives of the ancestral winged insects, since the group as a whole is as little modified as any known winged forms. The nearest relatives of the Perlids

are the Embiids (and Forficulids) but the Phasmid, Grylloblattid and Termitid lines all appear to converge toward the line of descent of the Perlid group, such forms as *Timema, Grylloblatta,* etc., being very similar in many respects to the more primitive members of the Perlid group. Such Orthoptera-like Perlids as *Eustheuia* would doubtless be of great interest from the point of view of the study of the rather close relationship of the Perlids to the Orthopteroid forms; but, unfortunately, I have been unable to procure specimens of this interesting genus for study. The Perlid group constitutes the order *Plecoptera,* and, as will be discussed further on, the Perlid and Blattid lines of descent converge as we follow them further back, and ultimately approach the line of descent of the Lepismids. Indeed, such immature Plecoptera as nymphs of *Peltoperla* are surprisingly *Lepisma*-like, indicating a rather close relationship between the two groups, although we are dependent upon *immature* forms to furnish the "connecting links" between the ancestors of the Perlids and the ancestors of the Lepismids, while in the Blattid group, even the *adult* forms have departed but little from the condition characteristic of the ancestral Lepismids; so that the Blattids are probably somewhat closer to the Lepismids than the Perlids are.

The Mantoid line of descent parallels that of the Blattoid group quite closely, and also approaches the Perloid line near the point at which the Blattoid line draws near to that of the Perlids, as is shown in the diagram. Certain Mantoid forms, such as *Mantoida luteola* exhibit affinities with the Neuropteroid forms; but this is to be expected, since the Mantids and Neuroptera both approach the Perlid line of descent, and would therefore have many characters in common. On the whole, however, I would place the Mantoid line somewhat closer to the Blattoid line, than to the Perloid line of descent, as is indicated in the diagram. The Mantoid forms constitute a distinct order, which may be termed the *Eudictyoptera,* since both Mantids and Blattids were formerly grouped together in the order Dictyoptera. The reasons for regarding the Mantids as a distinct order will be given elsewhere.

As may be seen from the diagram, the Blattoid line of de-

scent is the most direct of the developmental lines leading from the ancestors of the Lepismids to those of the winged forms, and even in the adult stages, the Blattids have preserved many characters common to the ancestors of the Lepismids and Blattids of today. The Blattid line of development is very closely paralleled by that of the Mantids, and ultimately the lines of descent of the Blattids and Perlids converge, if we trace them back far enough. Indeed, it would appear that those features wherein the most ancient Blattoid forms differ most from their modern representatives, are those in which they approach the closest to the Perloid forms, so that the two lines of descent in all probability sprang from ancestors similar enough to be grouped in a single family, although their modern representatives have followed rather widely divergent lines of development. The Blattid line of development is rather closely approached by that of the Termites; but the Termite line of descent appears to lead back to that of the Perlids rather than to the Blattid group. The Blattids are enough different from their nearest relatives to be grouped in a distinct order, and were therefore designated as the *Palaeoptera* in a previous paper (Ent. News, Vol. 26, p. 349).

The foregoing statements may be briefly summed up as follows: The Phylliidae are closely related to the Phasmidae and also to the true Locustidae (usually termed "Acrididae"). The true Locustidae ("Acrididae"), Tettigonidae ("Locustidae"), and Gryllidae arose from forms intermediate between the Grylloblattid and Phasmid lines of descent. The Phasmid, Grylloblattid, Forficulid, Embiid and Termitid lines of descent all converge upon that of the Perlidae, although the Forficulid and Embiid groups are somewhat nearer to the Perlidae than are the other groups. The Perlids, as a whole, are the most primitive of the groups thus far mentioned, but are not more primitive than the Blattidae. The Mantid line of development closely parallels that of the Blattid group, and approaches the Perlid line of development near the point at which the Blattid and Perlid lines of descent converge. The ancestors of the forms giving rise to the Blattid and Perlid lines of develop-

ment were doubtless similar enough to be grouped in a single family, or sub-family, whose ancestors in turn, if traced further back, would be similar enough to the ancestors of the Lepismid group, to be classed in a single family with them. In the same way, if we continue to trace the lines of descent still further back, the ancestral groups would be successively more and more inclusive (i. e. the ultimate ancestral types become more and more alike, the further back we go) until we at length reach the ancestral stem-family containing the similar forms which were eventually to give rise to the various Apterygotan and Pterygotan lines of descent with all their subdivisions and ramifications.

In a recent issue of the Zeitschrift f. wiss. Insektenbiologie (Bd. XI, 1915, Heft 9-10, pp. 269-273) I expressed the opinion that there were several lines of descent leading from the ancestors of the Apterygota to those of the Pterygota*, and I further suggested that the similarities in structure between the Protura (or "Myrientomata") and the Plecoptera, or between the Dicellura and the Dermaptera would indicate that there have been lines of descent leading from the ancestors of the Protura to those of the Plecoptera, and from the ancestors of the Dicellura to those of the Dermaptera. The study of new material (such as nymphs of *Peltoperla*, specimens of Lepismids from the Galapagos Islands, etc.) not available at that time, however, has led me to interpret these facts in another way. While I still believe that there are numerous lines of descent leading from the ancestral *groups* which gave rise to the ancestral Apterygota to those *groups* which gave rise to

* This paper, which was submitted for publication more than two years ago, recently appeared in the "Zeitschrift" despite my request to withdraw it. Furthermore, since the proof sheets were never sent me for correction, the article is full of obvious typographical errors, such as the total absence of capital letters in the title, misspelled words in the text (e. g. "sence" for sense), and even the omission of certain words which have totally altered the meaning of certain of the statements (e. g. on page 271 the statement "the Apterygota are no more to be regarded as degenerate Pterygota, than Amphioxus is to be regarded as a *vertebrate*" should read—than Amphioxus is to be regarded as a *degenerate vertebrate* (!)).

the ancestral Pterygota, I do not think that there was as direct a line from the ancestors of the Dicellura to those of the Dermaptera, or from the ancestors of the Protura to those of the Plecoptera, as my former statements would lead one to infer, and I would prefer to explain the similarities between the Dicellura and Dermaptera, or between the Protura and Plecoptera, as follows:

The Forficulid and other lines of development of the Orthoptera-like groups converge either toward the Perlid, or the Blattid line of development; and both the Perlid and Blattid lines ultimately lead back to, or closely parallel, the Lepismid line of descent. Ultimately we reach the more remote ancestral group containing the common ancestors of the Lepismid, Blattid and Perlid lines of descent. If we trace the lines of development of this ancestral group still further back, we find that the more remote ancestors of the forms giving rise to the Lepismid line of descent, in turn possessed many characters common to the remote ancestors of the Japygid, Proturan, and other Apterygotan groups; and the common ancestors of all these were doubtless so similar that they might be classed in a single family or even sub-family. From this common ancestral stem-family there arose the various lines of descent leading to the different Apterygotan and Pterygotan groups of insects; and since all these lines have a common origin, it is merely to be expected that the Forficulids, for example, might retain certain features which have also been retained by the Japygids, or that the Plecoptera might have retained certain features which have also been retained by the Protura, etc. The resemblances between the Japygids and Forficulids, or those between the Plecoptera and Protura, might therefore possibly be regarded as due to the retention in each, of certain features derived from their ancient common ancestral stem group, rather than due to the fact that they indicate that there are distinct lines of descent leading from the immediate ancestors of the Japygids to those of the Forficulids, or from the immediate ancestors of the Protura to those of the Plecoptera, etc. At any rate, the ancestors of the Forficulids and Plecoptera were too closely related to be descended from

two distinct groups of insects, and such annectent forms as the nymphs of *Peltoperla* serve to bring the Plecopteron line of descent very close to that of the Lepismids; so that I am inclined to believe that all of these lines of descent of the Orthopteroid insects ultimately approach very close to that of the *Lepisma*-like forms, as is shown in the diagram. It should be borne in mind, however, that since no group of living insects is descended from any other group of living insects, close resemblances are largely an expression of close parallelism in the lines of descent.

Before leaving the discussion of the lower winged insects, it is necessary to briefly touch upon the relationship of the Libellulid, Ephemerid and Neuropteron groups to each other and to the Orthopteroid groups of insects, since the Libellulids, and Ephemerids in particular, are very primitive, although somewhat aberrant types of insects. By the term "Orthopteroid" is meant all of those Pterygotan forms whose lines of development approach that of the Blattids or Perlids (e. g. the Perlids, Phasmids, Phylliids, Locustids, Tettigonids, Gryllids, Grylloblattids, Forficulids, Embiids, Termites, Mantids and Blattids).

The Libellulid group or *Panzygoptera* (i. e. Zygoptera and Anisoptera) is apparently related to both the Ephemerids and the Neuroptera (i. e. the line designated as the Neuropteradelphia) and also approaches closely to the Perlid-Embiid line of descent, as is indicated in the diagram. The Libellulids may perhaps be regarded as occupying a position intermediate between the Neuropteroid insects, such as the Ascalaphidae, etc., and the Perlid-Embiid group, but possibly ultimately approach the Ephemerid line of descent.

The Ephemerid line of descent is a rather puzzling one to trace. It approaches the Neuropteron group, and also approaches the Libellulid ("Odonatan") line of descent, but ultimately appears to draw near to the Perlid line, as shown in the diagram, although it does not parallel this line as closely as one might be led to expect from the rather close relationship between the Ephemerids and the Neuropteron group. The Ephemerids are in certain respects among the most

primitive of winged insects, although in other respects they are decidedly specialized. They are to be regarded as a markedly aberrant group related to the Neuropteroid insects, as well as to the Libelluloid and Perloid lines of development. They appear to approach as closely to the Lepismoid forms as to any of the Apterygotan insects, and the immature stages of *Heptagenia* and *Hexagenia* are strikingly Crustacea-like in certain respects (such as the mouthparts, etc.) as will be discussed in another paper. The Ephemeroid forms constitute the order Plectoptera of Packard.

The Neuropteradelphia form a section of the class Insecta, containing the Neuroptera and those insects which have descended from forms not unlike the ancestors of the Neuroptera. As was mentioned above, the Neuropteroid forms are related to the Ephemeroid group as well as to the Libelluloid group, and also approach the Plecopteron (Perloid) line of descent. The Neuropteron line of descent not only approaches that of the Plecoptera but also approaches the line of the Blattids and Mantids from another angle, which cannot be shown in the diagram, since it would be necessary to draw the Neuropteron line in a plane perpendicular to that of the diagram, in order to bring out this double relationship. The relationship of the Neuropteron group to the Plecopteron (Perlid) group is somewhat closer than that of the Neuropteron group to the Blattid-Mantid group; and the resemblance between the Neuroptera and the Blattid-Mantid group may possibly be due to the fact that both are related to the Plecopteron group—in other words the Neuroptera may be related to the Mantids through the mediation of the Plecoptera. A comparison of certain Mantid forms (such as *Mantoida luteola*) with certain Neuroptera, however, has led me to think that the Mantids, Perlids and Neuroptera may form the three apices of a triangle, each apex of which is connected with the other two by mutual bonds of relationship, so that the relationship between the Neuroptera and the Mantids is possibly more direct than through the mediation of the Plecopteron group, to which both are related.

(To be continued)

Mycetobia and the Classification of the Diptera.

By FREDERICK KNAB, Bureau of Entomology, U. S. Dept. of Agriculture.

In a paper read at the ninth annual meeting of the Entomological Society of America, the writer proposed a new grouping of the lower families of Diptera, generally called Nematocera, dividing them into two series according to the character of the larval respiratory system.[1] In one series, Oligoneura, were placed those forms in which the larvæ showed the more primitive condition of a series of lateral spiracles, such as occurs in most terrestrial insects. In the other series, Polyneura, were grouped those forms in which the larval respiratory system had become profoundly modified in adaptation to aquatic life, a single pair of large functional spiracles occurring posteriorly. The grouping thus brought about appeared more natural also when the adult characters were considered.

In examining the available data concerning the larval spiracles, but one seeming contradiction was found. This was the genus *Mycetobia,* universally considered a member of the family Mycetophilidæ. Its larva was said to differ from all the others of that family by possessing but a single pair of spiracles, posteriorly situated, and showing a remarkable resemblance to the Rhyphidæ. This contradiction within a large and otherwise homogeneous group was already strongly felt by Osten Sacken.[2] He accepted the statements of three most careful workers,—Lyonet, Dufour and Perris—all agreeing on this point, but ended the discussion of the subject with the remark, "this is a problem yet to solve." The writer, finding *Mycetobia* the only case conflicting with his proposed grouping, became convinced that some error existed and suggested that the three great observers just mentioned might after all have been mistaken. It has now been made clear that they were correct, but the seeming contradiction has been explained in an unexpected manner, most gratifying from the view-point of the writer's ideas.

[1] The Nemocera not a natural group of Diptera. Ann. Ent. Soc. Amer., vol. 8, 1915, pp. 93-98.

[2] Berlin. Entom. Zeitschr., vol. 37, 1892, pp. 442-443.

Mons. D. Keilin of Paris, a careful student of dipterous larvæ, becoming interested in the question at issue, reinvestigated the larva of *Mycetobia*, and determined that the correspondence with *Rhyphus* is even closer than had been supposed. Evidently his suspicions were aroused that *Mycetobia* had been wrongly placed with the Mycetophilidæ, for he now suggested to Mr. F. W. Edwards of the British Museum an investigation of the imagos. The result of Mr. Edwards' study have appeared recently and tend to show that *Mycetobia* does not belong to the Mycetophilidæ, but to the Rhyphidæ, as was indicated by the larval characters.[3] For the detailed discussion of the characters upon which *Mycetobia* is referred to the Rhyphidae, the reader must consult Mr. Edwards' original paper. As this will not be generally accessible, the importance of the subject leads me to quote what he has to say regarding the wing-venation:

> The Rhyphidæ and Mycetophilidæ agree in having a costa which does not extend beyond the tip of the wing, but differ widely in that the former have a three-branched media and a discal cell, whereas the latter never have more than a two-branched media and no discal cell.
>
> At first sight it is not easy to connect the two types, but if in the wing of *Rhyphus* we suppress the third branch of the media, and with it the cross-vein forming the discal cell, a condition very much resembling that of *Mycetobia* is arrived at, and the following points of resemblance between the two genera become more apparent:—(1) the

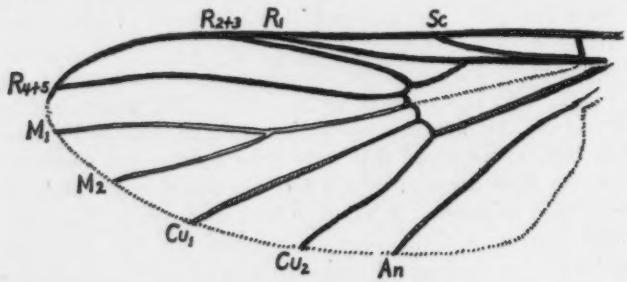


Fig. 1. *Mycetobia*, venation.

[3] On the systematic position of the genus Mycetobia, Mg. Ann. Mag. Nat. Hist., 8 Ser., vol. 17, no. 97, Jan. 1916, pp. 108-116.

radial sector forks basally to the R-M cross-vein, or, in other words, the small cross-vein is situated on the third longitudinal vein, instead of on the præfurca; (2) the lower branch of the cubitus is distinctly sinuous, the cell Cu_1 having a convexity on the lower side towards the base. The resemblance between the venation of *Mycetobia* (fig. 1) and *Olbiogaster* (fig. 2) is in some respects still more marked, and it is worthy of particular notice that in *Olbiogaster africanus* Edw., and still more conspicuously in *O. sackeni* Edw., the lowest of the three veins arising from the discal cell (M_3) is less strongly chitinized than the other two, suggesting that the venation of *Mycetobia* has arisen directly from that of *Olbiogaster* through the obsolescence of M_3.

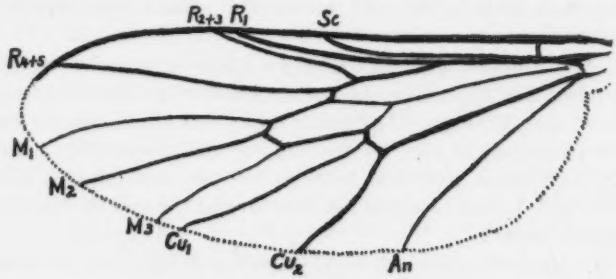


Fig. 2. *Olbiogaster*, venation.

In almost all other Mycetophilidæ the radial sector, when it forks at all, does so nearer the wing-apex than the position of the R-M cross-vein, which, besides, is usually sloping, and not straight as it is in *Mycetobia*. The only exception to this rule is the genus *Pachyneura*, in which the radial sector forks exactly at the R-M cross-vein. In all other Mycetophilidæ, with the exception of *Leiomyia* (*Glaphyroptera*) and its allies, the cell Cu_1 is concave instead of convex on its lower margin. *Ditomyia* and *Symmerus*, genera which, together with *Mycetobia*, have been made to form the subfamily Mycetobiinae, agree in both these respects with the other Mycetophilidæ, and I therefore consider that they are not at all closely related to *Mycetobia*. The genus *Mesochria*, recently described from the Seychelles Islands, is, on the other hand, closely related to *Mycetobia*. Its venation is very interesting, as the media is evanescent; it evidently represents a further stage of evolution from *Mycetobia*, in which the lowest branch of the originally three-branched media has already disappeared.

A comparison with other Diptera as regards the position of the radial fork reveals the fact that in the Tipulidæ, Culicidæ, Psychodidæ, Orthorrhapha Brachycera, and Cyclorrhapha, it always takes place

anteriorly to the R-M cross-vein, whereas in the Chironomidæ, Simulidæ, and Bibionidæ the radial sector is usually simple, but when it forks does so beyond the R-M cross-vein. An apparent exception to this rule, however, is the Bibionid genus *Eupeitenus*. It is also noteworthy that in the families of the first group the media is primitively three-branched, while in those of the second it is never more than two-branched.

Mr. Edwards disclaims having made an exhaustive investigation, but expresses the conviction that *Mycetobia* belongs with the Rhyphidæ. The writer hopes that other workers will be stimulated to take up the study of the relationships within the Diptera, and their bearings on the new ideas. With this end in view, I quote the summary at the end of Mr. Edwards' paper:

1. *Mycetobia* agrees with the Rhyphidæ and diverges from the Mycetophilidæ in the possession of a large gular plate, in the structure of the second palpal joint, in the position of the forking of the radial vein, the course of the cubital vein, and in the chitinous spermathecæ of the female. Since the venation of *Mycetobia* has been shown to be directly derivable from that of the Rhyphid genus *Olbiogaster*, it is probable that any resemblances in this respect to the Mycetophilidae are due to convergent evolution, and not to relationship. The genus *Mycetobia* (and with it *Mesochria*, though not *Ditomyia* or *Symmerus*) must therefore, on grounds of adult as well as larval structure, be transferred from the Mycetophilidæ to the Rhyphidæ.

2. It is at least possible that the characters of the gular plate and of the position of the radial fork will be found on full investigation to divide the Nematocera into two groups, and there is evidence that these groups may coincide with those founded on other characters, notably the tracheal system of the larva; this evidence, therefore, tends to confirm Knab's recent division of the Nematocera (Ann. Ent. Soc. Amer. vol. viii, p. 93, March, 1915) into Oligoneura, with peripneustic larvae, and Polyneura, with amphipneustic larvae. The genus *Pachyneura* seems to require special study, owing to the intermediate character of its venation, and *Eupeitenus* is also aberrant.

3. If, as seems probable from many considerations, the higher Diptera have been derived from the Polyneura and the Oligoneura represent an entirely distinct line of evolution, the primary division of the order should be neither into Orthorrhapha and Cyclorrhapha, nor into Nematocera and Brachycera, but into Polyneura and Oligoneura, the former including, in addition to the Tipulid-Culicid group of the Nematocera, the whole of the Cyclorrhapha and the Orthorrhapha Brachycera.

Two new dark-colored Species of the Genus Eurycotis (Orthoptera, Blattidae).

By MORGAN HEBARD, Philadelphia, Pennsylvania.

(Plate XIV)

Eurycotis abdominalis new species. (Plate XIV, Fig. 2.)

The present species appears to be widely separated from any of the known forms of *Eurycotis*. Its position in the genus is after the smaller and more slender species (which include the genotype, *E. mysteca*) and before the large and heavy species (in the linear arrangement of which we would put first, *E. tibialis*, here described). This insect is distinctive in the shining blackish coloration with striking vinaceous-rufous spots on each side of the metanotum and the six proximal dorsal abdominal segments. The shape of the caudal margin of the pronotum and of the lateral tegminal pads, the degree of latero-caudal production of the fifth to seventh dorsal abdominal segments and the shape of the supra-anal plate are also of decided diagnostic importance.

TYPE: ♀ ; Central America. (Rev. T. Heyde.) [Hebard Collection Type No. 420.]

Description of Type. Size medium large for the genus, form robust. Head much as in *E. opaca;* large, face weakly convex, ocellar spots in normal position (meso-dorsad of antennal sockets) almost obliterated. Pronotum with polished surface smooth but showing faint irregularities, evenly convex except cephalo-laterad where the convexity is more decided; cephalic margin transverse but convex ventrad, thus embracing the head, the cephalic angles thus being deflexed, these broadly rounded; lateral margins broadly convex to caudal angles which are produced caudad and sharply rounded; caudal margin transverse but rather strongly though broadly concave in each lateral third, the mesal third being broadly convex. Tegmina represented by small lateral pads extending to end of basal fifth of metanotum; surface polished but cribroso-rugulose, weakly convex except at costal margins where they are flattened; costal margin weakly convex, sutural margin strongly convex to sharply rounded apex situated on costal margin. Surface of mesonotum, metanotum and dorsal abdominal segments including supra-anal plate, as polished and smooth as pronotum. Caudal margin of metanotum very similar to that of pronotum but with produced latero-caudal angles more sharply rounded. Latero-caudal angles of fifth to seventh dorsal abdominal segments produced in increasing ratio caudad with sharp apices, these productions not nearly as decided

and broader than in *opaca*, the longest less than half the diameter there of the segment. Supra-anal plate triangularly produced; surface convex mesad, becoming somewhat more decided meso-distad, concave laterad; free margin weakly convex laterad, sharply and roundly emarginate mesad, the lateral productions thus formed rounded to an equal degree. Subgenital plate of normal form in the genus. Limbs and armament of the same normal for the genus, no indication of enlargement or flattening of the caudal tibiae.

Measurements (in millimeters) of type.

	Length of body	Inter-ocular width	Length of pro-notum	Width of pro-notum	Length of tegmen[1]	Width of tegmen	Greatest width of abdomen	Length of caudal tibia
♀	30.6	4.7	8.8	13.1	6.6	3.2	15.7	11.6

Coloration. Shining blackish brown above and below; a large, longitudinal, oval, slightly raised spot of cinnamon rufous laterad on the metanotum, and each dorsal abdominal segment with a broad lateral mark of this color, these widening caudad as their internal margins are oblique, but at the immediate caudal margin of each segment a narrow invasion of the dark general coloration occurs.

The type is unique.

Eurycotis tibialis new species. (Plate XIV, Fig. 1 and Text Fig.)

This unicolorous insect is likewise anomalous, but should be placed first among the broad species of the genus; immediately following, but in no wise closely related to *E. abdominalis*.

This species is followed in linear arrangement by *E. opaca* but differs widely from that insect in the more decidedly flattened head, distinctive lateral tegmina, less produced margins of the fifth to seventh dorsal abdominal segments (in this feature intermediate between *abdominalis* and *opaca*), distinctive supra-anal plate in both sexes and subgenital plate in male, remarkably enlarged and flattened caudal tibiae and proportionately longer caudal tarsal joints which are contained 1.24 times in the caudal tibial length, (in *opaca* 1.5 to 1.73 times.)

TYPE: ♂; San Francisco Mountains, San Domingo, September, 1905. (Aug. Busck.) [United States National Museum.]

Description of Type. Size medium large for the genus, form robust. Head much as in *E. opaca* but with face distinctly more flattened;

[1] A third of the tegmen is covered by the projecting latero-caudal angles of the pronotum.

large, face very weakly convex, ocellar spots represented by minute buffy dots in normal position. Pronotum with polished surface convex, this more decided mesad, microscopically punctulate particularly laterad; cephalic margin transverse but convex ventrad thus embracing the head, the cephalic angles being deflexed but not as suddenly as in *E. abdominalis,* these being broadly rounded; lateral margins broadly convex to caudal angles which are moderately broadly rounded, the lateral and caudal margins forming an angle there of very slightly less than a rectangle; caudal margin transverse but with a very weak and broad convexity indicated on each side. Tegmina represented by small lateral pads extending very slightly beyond the caudal margin of mesonotum; surface polished but microscopically punctulate, flattened with costal margin alone thickened, cingulate; costal margin very weakly convex, sutural margin very weakly concave, distad oblique truncate with sutural angle slightly the more produced.[2] Surface of mesonotum, metanotum and dorsal abdominal segments including supra-anal plate as polished and even less punctulate than pronotum. Caudal margin of mesonotum rect-transverse in mesal third, very slightly produced laterad with latero-caudal angles sharp and sub-rectangulate. Latero-caudal angles of fifth to seventh dorsal abdominal segments produced in increasing ratio caudad with sharp apices, of the form found in *abdominalis* but more decided, when compared with *opaca* the latter is seen to have these productions distinctly more slender and more strongly produced. Supra-anal plate produced, decidedly less transverse than in *opaca,* lateral margins concave proximad, distad the plate is briefly bilobate, the weak median emargination thus formed being rectangulate, the distal margin decidedly hairy but without serrulations as found in *opaca.* Subgenital plate strongly transverse, with stout and very elongate and tapering styles placed symmetrically meso-laterad in decided emarginations as is usual in the genus; median half produced, with distal margin broadly and roundly obtuse angulate emarginate, this weak but distinct. Cephalic and median limbs and armament of the same normal for the genus. Caudal femora heavier than usual; caudal tibiae also heavier than usual and very decidedly broadened just proximad of the mesal point, where on both cephalic and caudal faces a distinct oblong concave area is found, this nearer the dorsal than the ventral margin; caudal tarsal joints unusually long for the genus, contained but 1.25 + times in the caudal tibial length.

[2] The tegmina are asymmetrical in the adventive female before us; the dextral is normal, weakly oblique-truncate distad with sutural angle slightly the more produced and more obtuse-angulate, both angles rather sharply rounded; the sinistral is decidedly oblique-truncate with sutural angle decidedly the more produced and acute angulate but broadly rounded.

Allotype: ♀; San Domingo. August, 1905. (Aug. Busck.) [United States National Museum.]

Description of Allotype. Agrees with male except in the following features. Size slightly larger. Produced latero-caudal angles of dorsal abdominal segments very slightly more decided (as shown also by this sex in *opaca*). Supra-anal plate produced, narrower and more strongly emarginate mesodistad than in *opaca;* lateral margins weakly convex, mesal portion deeply subrectangulate emarginate with margins weakly convex, the lateral productions thus formed being equally convex on each side with apex rather sharply rounded. Subgenital plate of normal form in the genus. Caudal tarsal joints contained 1.28 times in the caudal tibial length (in the other female before us 1.24 + times).

Eurycotis tibialis new species. Caudal face of caudal tibia of *allotype* ♀. (x 2.)

Measurements (in millimeters).

	Length of body	Interocular width	Length of pronotum	Width of pronotum	Length of tegmen[3]	Width of tegmen[4]	Length of caudal tibia	Length of caudal tarsal joints
♂, *type.*	27.5	3.7	9.4	13.3	6.8	3.6	11.2	8.9
♀, *allotype.*	29.5	3.6	9.8	13.9	7.2	3.9	11.9	9.3
Adventive ♀.	31.0	3.7	9.8	13.7	7.4	3.8	11.2	9.0

Coloration. Very dark brown except inconspicuous minute ocellar dots, antennal sockets and soft portions of clypeus which are buffy. Pronotum, mesonotum, tegmina and metanotum almost black to blackish chestnut. Head and abdomen above and below black with a brown suffusion. Antennae auburn becoming blackish near the base. Coxae and femora almost black to blackish chestnut, the latter in the paler condition becoming darker distad; tibiae and tarsi black with a brown suffusion.

Specimens Examined: 3; 1 male and 2 females.

San Francisco Mountains, San Domingo, September, 1905. (A. Busck), 1 ♂, *type,* [U. S. N. M.].

San Domingo, August, 1905, (A. Busck), 1 ♀, *allotype,* [U. S. N. M.].

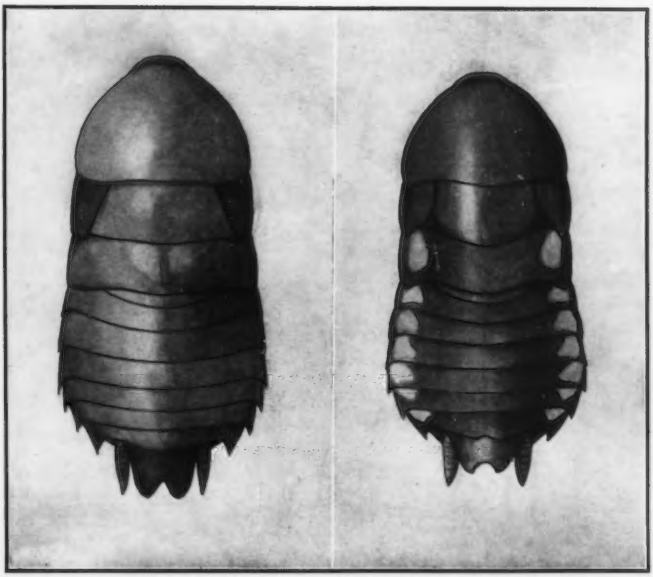
Adventive at Orono, Maine, 1 ♀, [Maine Agric. Exp. Sta. Cln.].

EXPLANATION OF PLATE XIV.

Fig. 1. *Eurycotis tibialis,* n. sp. Dorsal view of allotype. ♀. (× 2.)
Fig. 2. *Eurycotis abdominalis,* n. sp. Dorsal view of type. ♀. (× 2.)

[3] The tegmina in nearly their proximal half are concealed by the pronotum. The measurement is of total length.

[4] This measurement is taken at the margin of the pronotum.



1. EURYCOTIS TIBIALIS, ♀; 2. E. ABDOMINALIS, ♀.—HEBARD.

Butterflies of a Mountain Park in Colorado (Lep.).*

By E. L. Reed, Agricultural and Mechanical College of Texas, College Station, Texas.

During the summers of 1914 and 1915 the writer made a study of the true butterflies of Boulder Park, Colorado, and vicinity. The park is located forty-seven miles from Denver on the Denver and Salt Lake Railroad and has an altitude of 8989 feet. It is surrounded by mountains and is about two and one-half miles long by one mile wide. The floor of the park is composed mainly of dry grasslands and meadows while the surrounding mountain sides are covered with pine and spruce forests with occasional patches of aspens and alders. South Boulder Creek flows in a winding course through the park. Four gulches lead into it; South Boulder Canyon and Mammoth Gulch at the upper end, Jenny Gulch and Jenny Lind Gulch at the lower end. About the center of the park is situated the village of Tolland.

The altitude necessarily gives the park a cool summer climate, scarcely three consecutive weeks passing without frost; ice is sometimes formed in mid-summer. The mean July temperature is about 58 degrees Fahrenheit. The first part of the summer season is usually without much rainfall but the latter part has numerous showers. Throughout the summer there is an abundance of flowers.

The butterflies listed in this paper were collected in the park and the gulches leading into it. Three families are represented by twenty-four genera and forty-three species. Twenty-five of the species are exclusively montane and boreal forms. The other species are lowland types that reach the altitude of nine thousand feet or more. Twenty-six species appear in relatively large numbers each year but the other seventeen species are seldom abundant and one or more of these may be entirely absent during any one season. Those marked with an asterisk (*) are relatively abundant each year;

*This is a part of the work done at the Mountain Laboratory at Tolland, Colorado, in a course in the graduate school of the University of Colorado.

the others are seldom found in abundance. The nomenclature is that in the "Butterfly Book," by Dr. W. J. Holland, New York, 1901.

Family NYMPHALIDAE

Anosia plexippus Linnaeus
**Euptoieta claudia* Cramer
**Argynnis edwardsi* Reakirt
* " *cornelia* Edwards
* " *eurynome* Edwards
Brenthis freija Thunberg (alpine and boreal)
" *helena* Edwards
" *epithore* Thunberg
Melitaea nubigena Behr
Phyciodes camillus Edwards
" *tharos* Drury
Grapta gracilis Grote and Robinson (alpine and boreal)
Vanessa antiopa Linnaeus
milberti Godart
**Pyrameis cardui* Linnaeus
* *huntera* Fabricius
**Basilarchia weidemeyeri* Edwards
**Coenonympha ochracea* Edwards
**Erebia epipsodea* Butler
**Satyrus charon* Edwards
Oeneis chryxus Westwood (alpine and boreal)

Family LYCAENIDAE

Thecla irus Godart
**Chrysophanus helloides* Boisduval
* " *rubidus* Behr
* " *sirius* Edwards
**Chrysophanus thoe* Boisduval
**Lycaena heteronea* Boisduval
* " *lygdamas* Doubleday
* " *rustica* Edwards
* " *saepiolus* Boisduval

Family PAPILIONIDAE

Pieris napi oleracea-hiemalis Harris
" *napi pallida* Scudder
* " *protodice* Boisduval and Leconte
* " *rapae* Linnaeus
**Nathalis iole* Boisduval
**Euchloe ausonides* Boisduval
Euchloe sara julia Edwards
**Colias alexandra* Edwards
* *eurytheme* Boisduval
Terias mexicana Boisduval
**Parnassius smintheus* Doubleday and Hewitson
Papilio asterias Fabricius
* " *zolicaon* Boisduval

Entomologists at the Graduate School of Agriculture.

The prospectus for the elaborate courses of this School, to be held at the Massachusetts Agricultural College, Amherst, Mass., July 3-28, 1916, includes the following names among those who are to take part in the course on growth: Professors C. M. Child, V. E. Shelford and H. T. Fernald.

The Phasmidae of Minnesota, Iowa and Missouri (Orth.).

By M. P. Somes, Mountain Grove, Missouri.

The Phasmidae, or, as commonly known, "Walking Sticks," comprise a group of most interesting insects and since those found within our territory are of good size and simple structure they should be better known. But one species has been commonly recorded from this area. As known at present, there are four species, representing three genera. The genera may be separated as follows:

Elongate, slender wingless insects, with the mesothorax four or more times as long as the prothorax; tarsi five-jointed; middle and hind tibiae ventrally carinate to tip, without an apical areolate area; the antennae longer than the fore femora Subfamily Bacunculinae.

Hind femora in both sexes with a mid-ventral row of spines, large and strong in the female but often reduced to low knobs in the male; male cerci broadly spatulate; insects of very large size *Megaphasma* Caud.

Hind femora with but a single, subapical, ventral spine, or with but two small spines; male cerci not at all spatulate; slender insects of small or moderate size.

Hind femora of both sexes armed beneath with a subapical spine, prominent in the male, often minute or wanting in the female *Diapheromera* Gray.

Hind femora with no subapical spine beneath in either sex *Manomera* Rehn and Hebard.

The genus *Megaphasma* Caud. is, so far as now known, represented by a single species, *denticrus* Stal, the largest of our North American walking sticks and may readily be distinguished from any others within our area by the characters given in the key. The female has the mid-ventral row of spines on both middle and hind femora strong and distinct, while in the male these spines on both the middle and hind femora are all variable in size, save the prominent subapical spine. The ventral margins of both middle and hind femora are variably serrate. This species, heretofore considered as belonging to the area of the Gulf States, is not uncommon in the Ozark region and gradually scarcer to the northward. The most northern points at which we have taken this

species are Hamburg and Clarinda, Iowa. We have, however, had an insect described to us from near Fort Dodge, Iowa, by a very accurate, though non-entomological, observer, which, judging from size, must certainly have been this species. In this genus as in the following, the males are more highly colored and have the anterior femora green, while the females are almost unicolorous grayish or brownish. The immature forms are grayish, brownish or green, with the middle femora, especially in the female strongly marked with white spots. The legs of the young are quite short and decidedly stout. The species is found on shrubs and trees and does not apparently differ greatly in habits from the well-known *Diapheromera femorata.*

Diapheromera Gray is represented by two species which may be separated by the following characters:

Male cerci with a blunt basal tooth on inner margin; female cerci scarcely more than one-half as long as the eighth abdominal segment *D. femorata* Say.

Male cerci with an acute slender basal tooth on inner margin; female cerci decidedly more than half as long as the eighth abdominal segment *D. veliei* Walsh.

D. femorata Say is the most common and widely distributed of American walking sticks and because of its wide range is quite variable in size and coloration. It is probable that many records of this species may include one of the two following species. It is found throughout both Missouri and Iowa, while in Minnesota it is most common in the southern and eastern portions. The immature stages are of a soft greenish color and occur on tall grasses and herbage, while later in the season the adults are found on shrubs and trees.

D. veliei Walsh is much less common and tends to be rather local in distribution. It has been taken through most of western Missouri, from Joplin northward and through all of western Iowa, extending far up into the valley of the Red River of the North in Minnesota, where the writer has taken it as far north as Crookston. In the eastern portion of these three States, however, the records are more scattered. We have taken it at Spickard and Memphis, Missouri; Elmira, Central

City, Humboldt and Fertile, in Iowa, while in Minnesota, Staples is our most eastern record, though two immature specimens from Hinckley may possibly be referred here. This species averages smaller than *femorata*, especially in the males and these also tend to brighter coloration, being often quite distinctly marked with two light colored lateral stripes, the pleura being light colored in life though after drying the color is less distinct. This species tends to frequent tall grasses and low brush rather than trees and tall shrubs. It is often found on such plants as *Andropogon scoparius* Mx., *Lespedeza capitata* Mx. and *Salix humilis* Marsh.

Manomera Rehn and Hebard has, within these three States so far as known, but one species, *M. blatchleyi* Caud. In size this insect averages as about intermediate between the two species of *Diapheromera* just described, while in structural characters and appearance, it is very closely like *D. veliei*, save in the fact that there is no subapical spine beneath the hind femora in either sex. The coloration of the males is usually darker than in *veliei* which brings out the light colored pleura into stronger contrast. The females are scarcely distinguishable from those of *veliei*, save that the front margin of the first abdominal tergite is nearly straight, while in *veliei* it is arcuate. This insect has been taken as locally abundant at several points in the Ozark area and a single male was found at Center View in the northern part of Missouri. In Iowa it has as yet been taken only at Hamburg and at Moulton. It has not been taken in Minnesota and in all probability does not extend far into Iowa. Recently a well known collector told the writer that he had come to believe this insect must be parthenogenetic from the fact that while in his locality the females were plentiful, he had never taken a male. This has not been the case in our experience, as the sexes have been taken in about equal numbers. Specimens of both sexes have been compared with the type at the National Museum and show no differences.

The writer will be very grateful for any data as to new records and will be glad to examine Phasmids from these States for any interested collectors.

The Influence of Various Concentrations of Sea Water on the Viability of the Salt Marsh Mosquitoes Aedes sollicitans and Aedes cantator (Dip.).

By F. E. CHIDESTER, PH.D., and RAYMOND PATTERSON, B.S.

(From the Entomological Department of the New Jersey Agricultural Experiment Station, T. J. Headlee, Entomologist.)

In the course of an extensive study of the activity of the killifishes of the New Jersey coast, which was undertaken by the senior author at the request of the State Entomologist, it was deemed desirable to obtain records of the salinity, specific gravity and temperature of the water from which each collection was made. In the course of such record taking, it was noted that considerable difference in salinity existed in pools which contained mosquito larvae.

On April 18, two series of experimental jars were set up in one of the laboratories of the Entomology building. The first series of jars began with 100 cc. of sea water from Raritan Bay, with a salinity of 13 per cent. and ran down by steps of 10 cc. dilution with distilled water to pure distilled water in the eleventh jar. The object of this experiment was to determine what changes would take change in the larvae of salt marsh mosquitoes taken from pools with a degree of salinity of about 7 per cent. or 8 per cent. and forced to develop in water of a low salinity. The intention was to also subject *Culex pipiens* to a saline medium and try to change it into a salt water species.

The second series consisted of boiled down sea water, graduated in series by eight steps from 16 per cent. to 35 per cent. salinity. In this experiment the object was to determine what was the lowest toxic strength of salinity for the species used. The two series were supplemented by controls and by two jars of a 50-50 mixture of 13 per cent. sea water and redistilled water, placed at different temperatures, one kept low by running water (53° F.), the other placed in a greenhouse where the temperature ran up to 75° F. at times. The jars were covered with cheese cloth after having been supplied

with five second moult larvae and ten first moult larvae of the mosquito *Aedes cantator*. In the preparation of these experiments Mr. Raymond Patterson not only determined the species, but aided in the preparation of the jars of solution.

In the series running down from 13 per cent., it was noted that the larvae died rather quickly in the distilled water and in the higher per cents. In the series graduated from 16 per cent. up to 35 per cent. salt, all larvae died in the 22 per cent. jar and above in two days. Just as the records of these preliminary experiments were being considered and plans were being made for a more extensive series, the writer was invited by Mr. Patterson to go on a collecting trip to the marshes of Port Monmouth. On this trip we took records of the salinity of numerous pools, some of which contained no larvae. Two pools in particular engaged our attention. One with a temperature of 64° F. and a salinity of 22 per cent. contained many larvae of the species *Aedes sollicitans* of the second moult; the other pool, not ten feet away and similar in size, depth and character of bottom, with a temperature of 67° F. and a salinity of 24 per cent., contained no larvae at all. While probably of no great significance, the observation seemed at the time most important in the light of the preliminary experiments performed in the laboratory. Accordingly Mr. Patterson and the writer decided to carry on a large series of experiments to discover the effects of high salinity on the viability of mosquito larvae at different stages. Mr. Patterson was shortly forced to discontinue his work, but has aided substantially by furnishing larvae and field notes as well as by advice and information.

The records furnished by Mr. Patterson, Mr. H. I. Eaton and others indicate clearly that in the field *Aedes sollicitans* Wlk. lives and thrives in marsh water of a higher salinity than that which seems favorable to *Aedes cantator* Coq.

Extensive experiments carried on by the senior author show clearly that under laboratory conditions the viability of the larvae of the salt marsh mosquitoes in salt water depends not only on the salinity of the water from which they were taken, but also depends upon the species of larva. While rains may

lower the salinity of certain pools to such an extent that one finds larvae of several species of mosquitoes in the same pool, it has been shown conclusively that the resistance of the larvae to high salinities is different, following closely the records of the usual environments of the larvae.

There is much evidence to indicate that the distribution and time of appearance of the two dominant species of salt marsh mosquitoes is in part dependent on the amounts of salts present in the marsh waters at different distances from the sea. It is very probable that we shall find that a certain salinity is more favorable to the development of the eggs of one species than another.

Further discussion of the many experiments performed by the senior author will appear in the *Journal of Experimental Zoology* and in a technical bulletin of the New Jersey Agricultural Experiment Station.

The Sun-Dance of the Sawfly* (Hymen.).

By PHIL RAU, Saint Louis, Missouri.

A narrow strip of ground, five feet wide or less, lay between the River des Peres and a high railroad embankment. It was well overgrown at this point with grass and low dock and elderberry sprouts, with some scrubby trees nearby. The sun's rays beat down strongly on this April day, and the breeze was all cut off from this spot, so it seemed a humid, sweltering hole. Here in the bright sunshine, hovering above the vegetation, were thousands of sawflies, dancing in swarms like gnats. They were in several distinct groups of a hundred or more. The individuals were in constant motion, flying about with a smooth, gliding stroke in all sorts of round figures, circles, eights, S's, etc., but keeping within the limited space of the group as if that portion of the atmosphere had an invisible wall around it.

Each separate swarm poised in the air in one spot most of the time, but occasionally a whole group would move slowly and imperceptibly, like a rolling, floating cloud, for a distance

*Identified by Mr. S. A. Rohwer as *Macrophya* sp. nov.

of a few feet. It was a voluntary motion (*i. e.*, they were not merely carried by the wind, etc.), and yet there was no more evidence of the leadership of one or more individuals in the movement than there is evidence of one particle of fog leading a moving cloud. These changes were made so gradually and smoothly that the observer could scarcely notice them until he became aware that he must change his position to watch them.

The insects were so imbued with life and activity that I at once suspected that close observation would show this to be the marriage dance of this new species, so for four hours I watched them in an effort to solve their behavior.

It was soon apparent that, whatever the origin and significance of this frolic, it might safely be called a sun-dance, for they centered their dances only in the brightest spots of sunshine, where no leaf or twig marred the light.

They were almost always on the wing, but here and there a tired individual would drop to a leaf to rest, preen her antennae, brush her abdomen or wings with her hind legs, or rest quietly until she was chased away by another eager for a mate. They were never observed to rest on the ground, although in spots along the path the vegetation was sparse enough to encourage it.

While the great mass of the insects was whirling and dancing most of the time, I did not observe among them a single copulation or an attempt toward it on the wing, but among those which fell out of the dance and dropped down upon the leaves a very playful kind of mating frequently occurred. When a female alighted, she usually enjoyed only a moment's rest before she was disturbed by a male who pursued her, running backwards and attempting to mate. Sometimes he was active enough to catch her and accomplish a brief mating on the run; at other times he barely touched her abdomen as she reached the end of the leaf and fell off, when he would fly away into the dance again.

In this species the male does not mount the female as is the manner of some insects, but they always mate by the tips of the abdomens, with their heads in opposite directions. In

spite of the reversal of position the rear insect had no trouble in keeping up the race running backward, but I sometimes suspected that the female pulled him along with her while she was trying to get away. One might watch an active group for fifteen or even thirty minutes before seeing a case of this mating.

In watching them circle about in their dance I was not able at any time to observe a male chasing any one female, but when a pair was on a leaf ready to mate, or actually mating, several others would alight on the same leaf, attempt to mate and make life miserable for the couple, and usually break up the marriage. Perhaps this accounts for the instantaneous matings, since either opposition from the female or interference by other males makes it necessary. Sometimes three or four males were together in a heap, fighting for the possession of the female, but in these cases I think the female in question must have been a very attractive one, as I shall show in one case later.

Their very behavior led me to suspect that they were polygamous, and I personally observed enough repeated matings among them to confirm this impression and to make me sure that they are freely polygamous, although in a few instances I saw among them some slight expression of preference for certain mates. One pair mated in my presence and immediately a second male came along and separated them, pushed the rightful owner to the other end of the leaf and attempted to mate. The wife was faithful to the first, however, freed herself from the impostor, went to the other end of the leaf and again mated with her husband for the usual duration of a few seconds, walked to the end of the leaf and soared off on the wing to join her comrades in the dance. (They usually walked to the end of the leaf to take flight back to their group.)

The one case observed which, I was sure, was an actual copulation was of somewhat longer duration. They were united when I discovered them; how long they had been there I know not. Others soon tried to crowd in, and still others were on the same leaf. In an instant they were all one teeming mass of struggling life, many males burying the couple.

In order to make sure that it was a case of rivalry among the males I took them to ascertain the sexes; they were so intent upon their business that with one grasp of the hand I captured all of them but three; the eleven insects captured were ten males and one female. We may only surmise the sex of the three which escaped. When I placed those captured in the vial I noticed a mass of yellow substance hanging from the abdomen of the female; it was a cluster of a half dozen eggs. Whether these had been protruded after mating, or in sweeping with my hand I had forced them out, I do not know, but this seems certain: some females are more attractive than others, and this may be in relation to the maturation of their eggs. This may show also the value of the sun dance; the playfulness and the "false matings" being merely steps to the discovery of the individuals which are physiologically ready for immediate mating.

Later in the same week I went out to this place at 4.30 in the afternoon, looking for the sun dance or sleeping behavior of these sawflies. The weather was cloudy and threatening rain. Over the low grass over which they had frolicked so lustily a day or two before none were to be seen, but many were on the box elder leaves where, I judge, they were preparing to spend the night. They were not gregarious, but there was usually one to a leaf; they walked drowsily about, occasionally slowly biting at the leaf with the mandibles. They did not penetrate the leaf deeply enough to leave a mark upon it, but it appeared that they were getting the benefit of some invisible substance from the leaf, perhaps some liquid or some fuzz, but the whole process was slow enough to assure an observer that the activities were only those of tired creatures. A little later, about 6 o'clock, many were resting motionless upon the leaves, and while I could not return during the night to see if they were still in their places, I felt confident that they were settled for the night.

One week later, May 5, I returned to the place in the forenoon when I hoped for better results, but in my search from 10 to 12 o'clock I found only three wandering individuals, all females.

ENTOMOLOGICAL NEWS.

PHILADELPHIA, PA., JUNE, 1916.

A Duty of Specialists.

We recently received a letter from a specialist on a group of insects, with which none of the Editors or Advisory Committee of the NEWS are familiar, criticizing unfavorably the work of another writer on the same group published in the NEWS. The criticism was chiefly directed against the creation of synonyms by the second writer, who was taxed with ignorance of the existence of the *Zoological Record*, the *Concilium Bibliographicum* and the bibliographies given in the NEWS.

The author of the letter suggested an editorial on this subject, but at the same time appears to overlook certain aspects of the case. An exact knowledge of the species of any group of organisms is possessed only by the specialists on that group and on them devolves not only the right but also the duty of pointing out the errors committed by other students. It so happens that descriptions of alleged new species by the writer complained of have appeared in the NEWS for several years without calling forth any protest until this present. The Editors of the NEWS must take into account, as far as possible, all the various motives which actuate entomologists (who, after all, are human), and must refuse to undertake those tasks with which as non-specialists they have no business to meddle. At the same time they must remind the specialists of their own duties to be performed either by direct communication to offending authors or by frank and open criticism which the NEWS will always be glad to publish, as evidenced by its record in recent similar cases.

Index to Minnesota State Entomologist's Reports.

We have received from Prof. F. L. Washburn, State Entomologist of Minnesota, Circular No. 38 from his office, dated April 4, 1916, entitled "Index to the Fifteen Annual and Biennial Reports of the State Entomologist of Minnesota, published between 1895 and 1914, both dates inclusive, together with an appendix listing other publications of the State Entomologist and the Division of Entomology, University of Minnesota." This pamphlet of 40 pages has been compiled by O. J. Wenzel. The Index is "a combination of the indices of the fifteen annual and biennial reports of the State Entomologist of Minnesota . . . and it is hoped that it will be found useful to those possessing a complete or even partial set of the reports."

Every bibliographic work of this kind is a valuable guide in the great maze of entomological literature and the State Entomologist of Minnesota deserves our hearty thanks for this Index. Prof. Washburn asks us to state that his office, at St. Anthony Park, Minn., will be glad to mail copies to Entomologists as long as the supply lasts.

Notes and News.

ENTOMOLOGICAL GLEANINGS FROM ALL QUARTERS OF THE GLOBE.

Parallelodiplosis cattleyae Moll., in New Jersey (Dip.).

After searching various greenhouses during the past several years for this insect, I was at last definitely rewarded by finding it in orchid houses at Secaucus and Madison, New Jersey. The larval stages are passed as yellowish-white maggots in swellings near the tips of the roots of *Cattleya* and other species of orchids. This of course checks growth and disfigures the roots, sometimes causing them to die back and become black. One orchid grower informed me that a shipment of orchids received from Guatemala was so badly infested that practically all of the roots had to be trimmed off. This pest, known commonly as the Cattleya midge, is often confused by greenhouse men with the "Cattleya fly," *Isosoma orchidearum* West. (Hymen.), many of them assuming that the latter species is responsible for the root galls. The Cattleya midge is not by any means widely distributed in New Jersey greenhouses, but can undoubtedly be found in more than the two localities mentioned above, if persistently sought for.—HARRY B. WEISS, New Brunswick, N. J.

Observations on Ants in South Carolina (Hym.).

On March 18, the writer noticed ants attending *Toxoptera graminum*. The ants had nests at or near the base of oat plants on which the "green bugs" were feeding. The writer's attention was attracted by the unusual number of ants and nests in the field. The ants were identified as *Iridomyrmex pruinosus* var. *analis*.

Mr. J. A. Berly, of this Division, found a number of long, slender black ants in attendance upon the same species of plant-lice. The ants were *Dorymyrmex pyramicus*, or the common black lion ant.

The writer found *Prenolepis imparis* attending the black elder aphis, *Aphis sambucifolia*, on elder. Mr. G. M. Anderson, of this Division, found the same species of ants in attendance upon the cottony cushion scale, *Icerya purchasi*.

Two species of ants, *Crematogaster lineolata* and *Prenolepis imparis*, were found attending the scale on pine, identified by Mr. E. R. Sasscer, U. S. Bureau of Entomology, as *Toumeyella pini*. *Crematogaster lineolata* was also found attending *Aphis brassicae* on an unidentified plant of the mustard family.

Prenolepis imparis were observed swarming on March 19. One peculiar thing that was very noticeable was that spider webs had caught a large number of the winged forms; as many as six or eight were found in the same web.

A remarkably large nest of the small black ant, *Dolichoderus taschenbergi*, var. *atterina*, were found near a path at Clemson College. The nest was built under and around a large clump of broom straw, a

very common weed of waste places, and was so well concealed with particles of straw brought there by the ants that only very close observation revealed its location. There must have been several thousand in the nest, as they covered the ground everywhere. The writer's attention was attracted to this nest by the trail of the ants leading across the path. A large number were observed crawling up pine trees. This genus is recorded in Wheeler's "Ants" as an aboreal type. The identifications of the ants in most cases were made by Dr. Wheeler to whom the writer is indebted, while the Aphids were identified by Professor Thomas of this Division. The following species of ants were collected and added to the South Carolina list (see *antea*, page 110): *Crematogaster victima* subsp. *missouriensis, Crematogaster lineolata* var. *lutea, Prenolepis* (*Nylanderia*) *parvula*.—M. R. SMITH, Entomological laboratories, Clemson Agricultural College, Clemson College, South Carolina.

Feeding Habits of Sinea diadema Fabr. (Het.).

The nymph of this Reduviid when its attention is attracted by a moving object assumes an attitude of alert waiting. If the prey then becomes still, having the appearance of being dead, the Heteropteron will not molest it but will turn and walk away unconcernedly. If, however, the prey continues to manifest signs of life and starts to walk away, the *Sinea* will boldly stalk it, capturing it eventually. If the larva, perchance, starts toward the young *Sinea*, it does so only to meet death sooner in strong spiny arms.

On preparing to attack, the *Sinea* rears back until the body is almost vertical, the antennae point backward, the front femora point back and obliquely down away from the body; the tibiae extend upward and away from the body, forming a very obtuse angle with the femur. Sometimes the position is not so pronounced. The insect only rears slightly on its hind legs, allowing the front femora to point away from the body in a position ranging from obliquely upward to obliquely downward. The tibiae in cases like this extend outward and upward, still forming the very obtuse angle with the femora. The beak all the while remains in its normal position under the abdomen. The proper moment having arrived, the insect with a quick rush closes on its prey, simultaneously bringing the front legs down and fixing the larva firmly in the angle formed by the union of the femora and tibiae, where it is firmly held by the strong spines which are fixed to both these joints. At the same moment that this rushing attack is made, the comparatively long sharp beak of the young Reduviid is brought forward and plunged with a single quick stroke into the body of the prey. In a majority of cases the beak is found to be inserted into or near the thoracic region of the larva, and in one instance it was inserted almost into the base of the head capsule of a newly-hatched *Drasteria erechtea* larva.

If the larva attacked be large enough, it throws the young nymph about violently as it struggles to rid itself of the undesirable predator. The nymph struggles to retain its hold, however, at the same time attempting to crawl backwards in an effort to drag the prey, which it does if the latter be small enough, thus keeping the struggling larva away from its own body. In case the young nymph is thrown loose from the larva it usually gives up the attempt to capture, unless it be especially hungry or has the larva placed before it again, in which case it again attacks. Should the nymph retain its hold on the larva with the beak inserted, the prey soon ceases to struggle, giving up completely, seemingly rendered inactive by the pain of the inserted beak or perhaps by a fluid injected for that purpose.

Young *Sinea* no further advanced in development than at most the second instar have been seen to attack and capture lepidopterous larvae half an inch long. In one instance a squirming larva of *Drasteria erechtea* was held in the air in front of a young *Sinea diadema*. The nymph, about ⅛ inch long, approached cautiously and rearing back until the body was vertical, sprung off the floor almost straight upward for a distance of about one-fourth of an inch and captured the prey.

Living as this young insect does on larvae that are more or less active themselves, it is perhaps necessary that it be agile or it might as a species be materially reduced, if not drop out entirely, in the struggle for existence.

Adults feed in much the same manner.

The abundance of this species in the fields in summer together with this predaceous habit, establishes an economic factor of no little importance.—H. L. PARKER, Bureau of Entomology, Division of Cereal and Forage Crop Insect Investigations, Hagerstown, Md.

Targionia dearnessii Ckll. (Hem., Hom.).

This rather conspicuous scale, though widely distributed, is not commonly noted, for some reason. It first came to my notice by a purely automatic reflex and not at all as a result of search. I was, at the time, walking briskly along a country road, in late fall, when it suddenly came to me that there had been something peculiar about a small twig I had passed in the road. Retracing my steps for perhaps a rod, I picked up the twig, possibly six inches in length, and discovered that it was rather plentifully spotted with a whitish scale, having an *Aspidiotus*-like appearance but entirely unknown to me. Upon sending it to Mr. E. R. Sasscer, of the Dept. of Agriculture, Washington, I learned that it was *Targionia dearnessii* Ckll. Examining the twig I discovered that it was *Ceanothus americanus* L., or, as commonly called, "New Jersey Tea." This was in southern Missouri, some three years ago and, not being at that time familiar with the flora there, I was uncertain whether my find was local or, perchance, dropped from a load of hay imported from elsewhere. Early the following spring search

discovered the *Ceanothus* as local and further the fact that in scattered localities it was more or less coated with this scale. Keeping the facts in mind during my numerous trips throughout the state, I found this scale on the New Jersey Tea at numerous localities in most parts of the state. Later in Iowa, I found the same to be true there and in one little prairie valley near Iowa City, it occurred in greatest profusion, literally encrusting every stem. At this spot it was noted that many of the heavily encrusted stems were weakened and killed, while upon young stems this scale produced a very characteristic deformation, the stem being flattened and distorted. While widely distributed, it is within this part of the country at least local and has usually been found only in areas of a few square feet or at most square rods, while elsewhere in the locality, though the *Ceanothus* is abundant, it is free from scale. It is parasitized to some extent but we have been unable as yet to mature the parasites. Mr. Sasscer has been kind enough to give me the following data regarding the distribution of this insect, to which I have added those noted by me. To Mr. Sasscer I am further indebted for most of the citations of literature which follow:

Targionia dearnessii Ckll.

Arctostaphylos uva-ursi, shore of Lake Huron, Canada.

Bahia sp., Stevens Creek Canon, California.

Ceanothus americanus, Weeping Water, Nebraska; Tryon, North Carolina; Great Falls, Maryland; Mountain Grove, Cedar Gap, Springfield, Hollister, Marionville, Cape Girardeau, Hematite and Memphis, Missouri; Hamburg, Onawa, Iowa City, Moscow and Keokuk, Iowa.

Ceanothus ovatus, Tarkio, Missouri; Onawa, Iowa.

Greasewood (*Larrea*), Riverside, California.

Vaccinium sp., Grand Rapids, Wisconsin.

Liatris graminifolia, Ambrosia artemisiaefolia, Cranmoor, Wisconsin.

Antennaria plantaginifolia, Arlington, Virginia.

Symphoricarpos vulgaris, Mountain Grove, Missouri.

The principal references to this insect are the following:

Aspidiotus dearnessii Ckll., Can. Ent. XXX, p. 226; p. 266, 7 (Oct. '98) n. sp. Ckll.

Aspidiotus (*Targionia*) *dearnessii* Ckll. Bul. Ill. State Lab. Nat. Hist. V, art vii, p. 395, '99.

Targionia dearnessii Leon. Gen. Spec. Diaspiti, Aspid., p. 266 (1900).

Targionia dearnessii (Ckll.). Leonhardi, Riv. Pat. Veg., VIII, p. 343.

Aspidiotus (*Targionia*) *dearnessii* Ckll. King, Can. Ent. XXXIII, p. 199.

Aspidiotus dearnessii Ckll. King, Can. Ent. XXXIV, p. 160.

—M. P. Somes, Mountain Grove, Missouri.

Entomological Literature.

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded. The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of systematic papers are all grouped at the end of each Order of which they treat, and are separated from the rest by a dash.

Unless mentioned in the title, the number of new species or forms are given at end of title, within brackets.

For records of Economic Literature, see the Experiment Station Record. Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London.

For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

2—Transactions of the American Entomological Society, Philadelphia. **3**—The American Naturalist. **4**—The Canadian Entomologist. **5**—Psyche. **6**—Journal, New York Entomological Society. **9**—The Entomologist, London. **11**—Annals and Magazine of Natural History, London. **68**—Science, New York. **76**—Journal of the Cincinnati Society of Natural History. **86**—Annales, Societe Entomologique de France, Paris. **99**—Cornell University Agricultural Experiment Station, Ithaca. **102**—Proceedings, The Entomological Society of Washington. **179**—Journal of Economic Entomology. **180**—Annals, The Entomological Society of America. **181**—Guide to Nature, Sound Beach, Conn. **197**—Proceedings, Royal Society, Biological Sciences, London. **223**—Broteria, Revista de Sciencias Naturaes do Collegio de S. Fiel (Ser. Zoologica). **242**—Transactions, The Royal Society of Canada (3rd Series), Ottawa. **420**—Insecutor Inscitiae Menstruus: A monthly journal of entomology, Washington. **438**—Bulletin, Illinois State Laboratory of Natural History, Urbana. **447**—Journal of Agricultural Research, Washington. **475**—Bulletin de la Societe Vaudoise de Sciences Naturelles. **528**—Zoologica: Scientific Contributions of the New York Zoological Society.

GENERAL SUBJECT. Beebe, C. W.—Fauna of four square feet of jungle debris, **528**, ii, 107-19. **Bishopp, F. C.**—A method of keeping alcoholic specimens, **180**, ix, 94-6. **Crampton, G.**—The phylogenetic origin and the nature of the wings of insects according to the paranotal theory, **6**, xxiv, 1-39. **Dury, C.**—Natural history notes of southern Arizona, **76**, xxii, 4-13. **Hewitt, C. G.**—A review of applied entomology in the British Empire, **180**, ix, 1-34. **Martin, J. F.**—The thoracic and cervical sclerites of insects, **180**, ix, 35-88. **Russell, H. M.**—Life and works by Quaintance, Hyslop & Walton, **102**, xviii, 3-5. **Van Duzee, E. P.**—Priority in family names and related matters, **180**, ix, 89-93. **Webster, F. M.**—Obituary notice, **4**, xlviii, 73-6.

ARACHNIDA, ETC. Chamberlin, R. V.—Two new Texan Parajuli, **5,** xxiii, 33-6. **Hewitt, C. G.**—A contribution to a knowledge of Canadian Ticks, **242,** ix, 225-39.

NEUROPTERA, ETC. Banks, N.—A classification of our Limnephilid caddice flies, **4,** 1916, 117-22. **Needham & Smith**—The stone flies of the genus Peltoperla [7 new], **4,** 1916, 80-8. **Osburn, R. C.**—A migratory flight of dragonflies, **6,** xxiv, 90-2. **Williams, F. X.**—The pupa of Boreus brumalis, **5,** xxiii, 36-9.

ORTHOPTERA. Cockerell, T. D. A.—The fossil O. of Florissant, Colorado [2 new], **9,** 1914, 32-4. **Hebard, M.**—The genus Ceratinoptera; A new genus, Cariblatta, of the group Blattelites [1 new], **2,** xlii, 125-34; 147-186. A study of the species of the genus Stenopelmatus found in the U. S., **6,** xxiv, 70-86.

HEMIPTERA. Baker & Turner—Some intermediates in the Aphididae, **102,** xviii, 10-14. **Comstock, J. H.**—Reports on scale insects, **99,** Bul. 372, 601 pp. **Doncaster, L.**—Gametogenesis and sex-determination in the gall-fly (Neuroterus lenticularis), **197,** lxxxix, 183-200. **Wilson, H. F.**—Additional notes on the genus Pterocomma, **180,** ix, 103.

Ball, E. D.—New sps. of Eutettix and Phlepsius [7 new], **4,** 1916, 124-30. **Cockerell, T. D. A.**—Some grass-feeding mealy-bugs [2 new], **179,** ix, 312-13. **Davis, W. T.**—Notes on Cicadas from the U. S. with descriptions of several n. sps. [5 new], **6,** xxiv, 42-65.

LEPIDOPTERA. Bird, H.—Xanthoecia buffaloensis, its larval habit and occurrence within our fifty-mile faunal zone [of New York City], **6,** xxiv, 86-90. **Gerould, J. H.**—The inheritance of seasonal polymorphism in butterflies, **3,** l, 310-16. **Gibson, A.**—The life history of Leucobrephos brephoides, **4,** 1916, 133-8. **de Joannis, J.**—Etude synonymique des especes de Microlepidopteres decrites comme nouvelles par Duponchel, **86,** lxxxiv, 62-164. **Van Zwalenburg, R. H.**—Notes on the life history of Ecpantheria eridanus, **420,** iv, 12-17.

Barnes & McDunnough—An apparently n. sp. of Phalonia, **4,** 1916, 144. **Braun, A. F.**—New sps. of Microlepidoptera [3 new], **4,** 1916, 138-40. **Mosher, E.**—A classification of the L. based on characters of the pupa, **438,** xii, 17-159.

DIPTERA. Knab, F.—Four European D. established in No. Am., **420,** iv, 1-4. **Richardson, C. H.**—A chemotropic response of the house fly (M. domestica), **68,** xliii, 613-16. **Townsend, C. H. T.**—Non-intentional dispersal of muscoid species by man, with particular reference to tachinid species, **102,** xviii, 18-20.

Cockerell, T. D. A.—Two D. of the genus Rhamphomyia from Colorado [new], **4,** 1916, 123-4. **Cresson, E. T., Jr.**—Studies in American Ephydridae. 1. Revision of the species of the genus Paralimna, **2,** xlii, 101-124. **Dietz, W. G.**—Synoptical table of the No. Am. species of Ormosia, with descriptions of new species [11 new], **2,** xlii, 135-146. **Johnson, C. W.**—Further studies on the Platypezidae [6 new], **5,** xxiii, 27-33. **Knab & Shannon**—Tanypezidae in the U. S. [2 new], **420,** iv, 33-36. **Malloch, J. R.**—Three new No. Am. species of the genus Agromyza, **5,** xxiii, 50-4. **Schaeffer, C.**—New D. of the family Asilidae with notes on known species [8 new], **6,** xxiv, 65-9. **Townsend, C. H. T.**—Designations of muscoid genotypes, with new genera and species [6 n. gen.]; Elucidations of New England Muscoidea [11 n. gen.; 4 n. sps.], **420,** iv, 4-12; 17-33. **Travares, J. S.**—Cecidomyias novas do Brazil, **223,** xiv, 36-57.

COLEOPTERA. Cosens, A.—Notes on hibernating ladybird beetles, **4,** 1916, 104-5. **Leng, C. W.**—Notes on Cychrini, **6,** xxiv, 39-42. **Pierce, W. D.**—Notes on the habits of weevils, **102,** xviii, 6-10. **Sanders & Fracker**—Lachnosterna records in Wisconsin, **179,** ix, 253-61.

Achard, J.—Descriptions d'especes nouvelles de Scaphidiidae, **86,** lxxxiii, 555-62. **Blatchley, W. S.**—A new gen. and sp. of Nitidulini, with descriptions of other n. sps. of C. from Indiana and Florida [1 n. g.; 8 n. sps.], **4,** 1916, 91-6. **Calder, E. E.**—Cicindela hirticollis var. rhodensis n. var., **6,** xxiv, 93-4. **Champion, G. C.**—A new genus of Pythidae from the Falkland Islands, **11,** xvii, 311-13. **Dury, C.**—Two new beetles from Cincinnati, **76,** xxii, 14-15. **Glasgow, R. D.**—Phyllophaga Harris (Lachnosterna Hope): A revision of the synonymy, and one new name, **438,** xi, 365-79. **Swaine, J. M.**—Platypus wilsoni—a new sp. of Platypus from Br. Columbia, **4,** 1916, 97-100.

HYMENOPTERA. Britton, W. E.—Further notes on Diprion simile, **179,** ix, 281-2. **Falk, H. O.**—Animal intelligence again [ants], **181,** viii, 393-97. **McConnell, W. R.**—Notes on the biology of Paraphelinus speciosissimus, **18,** ix, 97-102. **Miller, J. M.**—Oviposition of Megastigmus spermotrophus in the seed of douglas fir, **447,** vi, 65-8. **Ramsay, L. N. G.**—Note on the oviposition of Rhyssa, **9,** 1914, 20-22. **Rohwer & Gahan**—Horismology of the hymenopterous wing, **102,** xviii, 20-76. **Timberlake, P. H.**—Note on an interesting case of two generations of a parasite reared from the same individual host, **4,** 1916, 89-91.

Cockerell, T. D. A.—Sunflower insects in California and South Africa [1 new], **4,** 1916, 76-9. Descriptions and records of bees.—lxxi [14 new], **11,** xvii, 277-87. **Forel, A.**—Formicides d'Afrique et d'Amerique nouveaux ou peu connus, **475,** l. 335-64. **Girault, A. A.**—Descriptions of eleven n. sps. of Chalcid flies [1 n. g.; 7 n. sps.], **4,** 1916, 100-103; 113-6. New Encyrtidae from No. Am. [5 n. gen.; 11 n. sps.], **5,** xxiii, 41-50. Notes on two South Am. parasitic H., **9,** 1915, 213-14. **Wheeler, W. M.**—Some new formicid names, **5,** xxiii, 40-1. **Williams, L. T.**—A new species of Thripoctenus, **5,** xxiii, 54-61.

Doings of Societies.

Feldman Collecting Social.

Meeting of February 16, 1916, at the home of H. W. Wenzel, 5614 Stewart St., Philadelphia. Eleven members present; Pres. H. A. Wenzel in the chair.

The President read his annual address, which had been held over from the last meeting.

Coleoptera.—Mr. Kaeber exhibited four specimens of a rare Nitidulid, *Psilopyga histrina* LeC., which he had found at Narberth, Pennsylvania, IX-6-'15 in decayed fungus, *Mutinus caninus* Huds. Mr. Greene said he had found specimens at the same time and place. The latter exhibited a specimen of *Plagiodera versicolor* Laich. which he had collected at Normandie Park Inn, Clifton, Passaic County, New Jersey, IX-19-'15; willow is very common on this property. This is recorded from Bulls Head, Staten Island, New York, by Schaeffer, J. N. Y. Ent. Soc., xxiii, p. 236, 1915.

Hymenoptera.—Mr. Daecke said he knew this was a peculiar season but he was surprised to see on January 30th about a half dozen honey bees on flowers at a stand in Harrisburg.

Lepidoptera and **Diptera.**—The same speaker stated that he had found larvae of *Ecpantheria deflorata* Fabr. at Rockville, Pennsylvania, X-19-'15, which immediately pupated. From these two parasitic Diptera emerged, XII-9-'15, *Blepharopeza adusta* Loew. These were exhibited.

Lepidoptera.—Mr. Geo. M. Greene read an article from *Popular Science Monthly* in which it told how the Sioux Indians used the larva of a butterfly to bore the pith from ash twigs so they could be used for pipe stems.

Homoptera.—Mr. Hornig said he had found eggs of the Seventeen Year Cicada in 1912 and they are still alive.

Adjourned to the annex.

Meeting of March 15th, 1916, held this evening at the same place; eight members were present. Pres. H. A. Wenzel in the chair.

Coleoptera.—Dr. Castle exhibited two specimens of *Dorcaschema alternatum* Say, which he collected at Enterprise, Florida, May 24. General discussion followed. Adjourned to the annex.—GEO. M. GREENE, *Secretary.*

Chicago Entomological Club.

Meeting of February 20, 1916, at home of Mr. Henry Ramstadt. Eleven members present.

Coleopterists discussed the Bruchidae and compared specimens.

Lepidopterists: Mr. Kwiat read an article on "Collecting Papai-

pemae" which was published in the May NEWS. The genus was discussed generally and the following species reported from the Chicago area, all but *cerina* and *inquaesita* having been bred.

cerina Grote.
cerussata G. & R.
circumlucens Smith
eupatorii Lyman
frigida Smith
var. *thalictri* Lyman
furcata Smith
harrisii Grote
impecuniosa Grote
inquaesita G. & R.
marginidens Gn.
arctivorens Hamps.
merriccata Bird
necopina Grt.
nelita Strk.
var. *linda* Bird
nephrasyntheta Dyar
nitela Gn.
var. *nebris* Gn.
pterisii Bird
rigida Grt.
sciata Bird
silphii Bird
speciosissima G. & R.

A. KWIAT, *Secretary.*

Newark Entomological Society.

Meetings held in the Newark (New Jersey) Public Library, February 13, March 12, April 9, 1916; Pres. Buchholz presiding; average attendance, ten members.

Dermaptera.— At the March meeting, Mr. Weiss showed a male and female of *Forficula auricularia* L., the European ear-wig, which had been taken at Newport, Rhode Island, where they had been found in considerable numbers.

Coleoptera.— Mr. Stortz at the April meeting, recorded the capture of *Lixus julichi* Casey, at Arlington, New Jersey, as early as April 2 and Mr. Weiss exhibited specimens of *Agrilus viridis* which breeds in rose stems in different parts of north Jersey and also *Exochomus 4-pustulata* from Riverton, New Jersey, this being an introduced "lady-bird" which has only been taken in this State a couple of times.

Diptera.— At the April meeting, Mr. Weiss also showed aerial orchid roots which had been deformed by the larvae of *Parallelodiplosis cattleyae*, found of course only in greenhouses in this climate.—

HARRY B. WEISS, *Rec. Secretary.*

The Ecological Society of America, Announcements.

An Illinois Section of the Ecological Society has been organized through the activity of Professors Forbes and Shelford. This local organization already contains 21 members, and is planning the prosecution of an ecological survey of Illinois.

Preliminary proposals have been made with regard to the carrying out of a soil temperature survey of the United States through co-operation of the American Society of Phytopathologists and the Ecological Society of America. Prof. L. R. Jones and Dr. J. B. Overton, of the

University of Wisconsin, have been chiefly instrumental in advocating this project. The Secretary will be glad to hear from members of the Society who have soil thermographs, and are interested in the arrangements for such a co-operative investigation.

A four-day field trip to the dunes of Lake Michigan, in the vicinity of Chicago, will be conducted from June 14 to 17 by Prof. H. C. Cowles, Prof. V. E. Shelford, and Dr. G. D. Fuller, in case a sufficient number of persons express interest in the trip. It is expected that one day will be devoted to the sand ridges and slough near Buffington and Clarke, Indiana, largely under the guidance of Professor Shelford. Other days will be devoted to the dune successions at Miller, Indiana, the moving dunes at Dune Park, the eroding dunes at Michigan City, Indiana, and those at Sawyer, Michigan, where telescoped successions and dune and climax forests are well displayed. The interest will centre in the interrelations of plants and animals, and the relation of each to the environmental conditions. The entire expense for lodging, meals, and transportation for the four days will be about $10. There will be no further general announcement of this trip. Members who plan to join it, or have even a remote prospect of doing so, are requested to communicate at once with one of the conductors. If enough favorable replies are received to justify offering the excursion a definite announcement will be made to those interested.

A field trip will be conducted at San Diego, California, on August 12 to 14, in connection with the meeting of the Pacific Division of the American Association. Prof. W. E. Ritter has invited members of the Society to visit the Laboratory of the Scripps Institution at La Jolla, near San Diego, and to examine the work and environs of that centre of marine ecological investigations. One or two days will also be spent, under competent guidance, in studying the biota of the chaparral at several favorable localities near San Diego, and in the foothills of the Cuyamaca Mountains. Further details of the San Diego trips will be announced about May 15.

Prof. A. O. Weese, of the University of New Mexico, proposes to conduct a field trip in the vicinity of Albuquerque, New Mexico, for those who may be able to stop off there on the way to or from San Diego. Several other men located on transcontinental railways have expressed a willingness to give some of their time to members of the Society who may be able to stop over with them at any time during the summer. The Secretary will be glad to have early information from those intending to be present at San Diego, and he will be glad to give information to prospective transcontinental travelers regarding possible stop-overs with other members.

The Secretary-Treasurer is no longer in Baltimore, but should be addressed

FORREST SHREVE, Tucson, Arizona.

EXCHANGES.

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

☞ **These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued**

Liberal exchange given for Lepidoptera needed for the collection of the American Entomological Society, 1900 Race St., Phila., Pa.

For Exchange—Insect Life, Vol. I, Nos. 4, 5, 6; Vol. II, Nos. 7, 8, 9, 10; Vol. III, Nos. 4, 5, 9, 10; Vol. 7, bound; U. S. Bur. Ent. Bull. (N. S.), Nos. 31, 44. Wanted 5th Ill. Report, and Riley's 9th Mo. Report.—E. G. Kelly, Wellington, Kansas.

Lepidoptera—I have for exchange Eastern U. S. Noctuidae and Geometridae mounted on pins, including *Catocala elonympha, similis, praeclara, gracilis, coccinata, epione, relicta* and varieties. Also cocoons of *P. cynthia* and *C. angulifera.*—John H. West, 2057 East York Street, Phila., Pa.

Wanted for cash—Lucanidae in perfect condition.—Joseph Brunner, Missoula, Montana.

For exchange—Entomological News, 1909, 1910, 1911, also Zeitschrift für wissenschaftliche Insecten Biologie, 1910, 1911, 1912.—Henry Wormsbacher, 1357 St. Charles Ave., Lakewood, Ohio.

Wanted—12 pair of *Argynnis idalia*, 3 pair *Arg. diana*, 2 pair *Arg. edwardsii* for exchange or cash.—A. F. Porter, Decorah, Iowa.

Wanted—Will pay cash for fertile females of the genus *Eubaphe* or give other Lepidoptera in exchange. Specimens from west and northwest especially desired. Write for details.—Alex. Kwiat, 2445 Eastwood Ave., Chicago, Ill.

Orthoptera—Especially from the mid-west examined for collectors. Correspondence invited.—M. P. Somes, Box 226, Mountain Grove, Mo.

Wanted for Cash or will give liberal exchange for Cetonidae of North, South and Central America. Send in your list.—Frank J. Psota, 316 So. Mozart St., Chicago, Ill.

Wanted—Fertile eggs of *A. luna, C. angulifera* and *Triplogon modesta;* preferably in exchange for better *Catocalae* (*lacrymosa*, etc.), and other St. Louis material.—F. T. Naumann, 1000 Washington Ave., St. Louis, Mo.

Wanted—*Catocala* from the Western and Southern States, and Cynipidae and their galls from all parts of North America. Will identify species in return for specimens.—William Beutenmuller, 879 Whitlock, Ave., Bronx, New York, N. Y.

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THE AMERICAN ENTOMOLOGICAL SOCIETY

announces the inauguration of a new series of entomological papers of monographic character, to appear as frequently as suitable manuscripts and sufficient funds are available, and to be called the **Memoirs of the American Entomological Society.** The Memoirs are to be of a large octavo size, and each paper will form a separate number complete in itself. As the individual numbers will probably vary greatly in the number of pages, above a minimum required for the series, no fixed price per number will be made, but the charge will be computed for each unit upon a pagination basis.

The first number of the Memoirs will be issued during the month of June, and will appropriately contain "The Cresson Types of Hymenoptera," by Ezra Townsend Cresson. This contribution will prove of the greatest value to the taxonomic Hymenopterist working on American forms, as it is a full catalogue of the 2737 species described by the author, with original references, selection of single types, location and number and condition of the same, to which is appended a bibliography of the entomological papers of the author. Further information regarding the paper, its pagination and price will be furnished on application.

AMERICAN ENTOMOLOGICAL SOCIETY, Logan Square, Phila'da, Pa.

N. B.—In reply to recent inquiries, the Society can no longer furnish copies of LeConte and Horn's Classification of the Coleoptera of North America, or Henshaw's List of the Coleoptera of America North of Mexico, both of which are out of print.

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